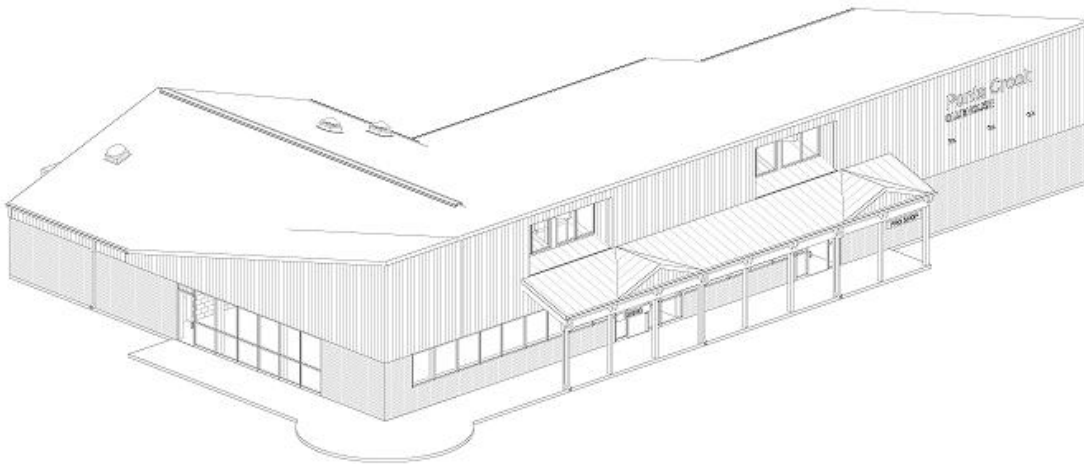


**NAVAL AIR STATION
MERIDIAN
MERIDIAN, MS**



**PONTA CREEK GOLF COURSE
CLUBHOUSE**



CONTRACT DOCUMENTS AND SPECIFICATIONS

SECTION C
GUIDANCE TO CONTRACTORS

1. PROJECT INFORMATION

1.1. Project Location: Naval Air Station Meridian, MS.

1.2. Background Information

A. The existing NAS Meridian Ponta Creek Golf Course Clubhouse is in an inadequate state to meet the increasing demands of its patrons. Demands for use of the facility have far outgrown the available space. An expansion to the facility as well as augmented parking will greatly increase the usefulness of the Clubhouse.

1.3. Project Description:

A. The following work shall be accomplished under a single Firm Fixed Price Contract:

1. All general, architectural/engineering items for construction of the facility.

B. The following work shall be performed under separate contracts:

1. Asbestos removal

1.4. Construction Magnitude: Between \$1,000,000.00 and \$1,225,000 .00

1.5. Special Conditions:

A. The adjacent streets shall remain open at all times during construction. Short-term closings of one-half of a street for utility trenching will be permitted with prior approval from the COR. Coordinate closings through the COR. Refer to Section H “Scheduled Outages”

B. LEED®: The project shall be constructed to meet or exceed the requirements for a LEED® Silver Certified rating.

1.6. Working Hours

A. Regular Working Hours: between 0700 and 1600 hours Monday through Friday excluding Federal holidays.

B. Work outside regular working hours: The COR may approve work outside regular hours. Submit a written request at least 96 hours in advance of the desired work time giving the specific dates, hours, and type of work to be performed. All work outside of regular work hours shall be approved in advance by the COR.

C. Security Requirements - Refer to Section H “BASE ACCESS”.

1.7. Permits

- A. The Contractor shall obtain and pay for all permits required by authorities having jurisdiction, including the Navy and non-Navy entities such as East Mississippi Electric Power. The Contractor shall certify completion of construction for all permits prior to final acceptance.
 - 1. The Contractor shall prepare and submit the applications for all permits and required close-out documentation to the COR who will submit them to the applicable Base agencies.
 - 2. Close-out documentation shall be submitted as soon as the permitted systems have been constructed.
- B. Base Permits: Obtain base permits for utility outages, excavation, “heat producing” or “spark generating” work, and utility connections prior to beginning these activities. Coordinate these permits through the COR with PW and the Base Fire Department. There will be no charge for these permits. Contractor shall call Mississippi One Call to identify all non-Navy utilities.
- C. The Contractor shall be responsible for compliance with all permit requirements. As-built drawings required by the permits will be in addition to all others generated by the proposed contract. As-built drawings for permits shall be signed and sealed by a professional Architect or Engineer registered in the state of Mississippi.
 - 1. The Contractor shall submit close-out documentation for each permit as required by the issuing authority and obtain acceptance of that documentation prior to final acceptance of the project and final payment by the NAFI.
- D. Construction shall not start until all permits have been obtained.

1.8. Hazardous Materials – General

- A. The Code of Federal Regulation (CFR) 20 CFR 1910.120 - Hazardous Waste Operations and Emergency Response is also incorporated by reference. This regulation requires that the Contractor submit a Health and Safety Plan for approval by the Government prior to beginning work at the site. An executed Hazmat form is required before work can begin. The form must be updated monthly and is available at FEAD.

1.9. Clean Water Act

- A. Non-stormwater discharges are not permitted unless approved by the Environmental and Safety Office, or are exempt from stormwater regulations according to Federal Register Vol. 69, No. 189, dated Sept. 29, 1995.

2. GENERAL INFORMATION

- 2.1. Intent: It is the intent of this Request for Proposal (RFP) to award a construction contract which will result in completed facilities of commercial quality and which will operate efficiently and without unreasonable architectural, structural, mechanical and electrical failure or deficiency throughout the expected life of the facilities. The selected Offeror's construction must meet this intent. Any planned deviation from this intent which is not brought to the attention of the Contracting Officer at time of offer by separate letter will render the deviation as not a part of the contract and the Contractor will be required to construct to the intent specified above.

2.2. Definitions: Throughout this RFP, certain terms, abbreviations and acronyms are used. The definitions for these items are as follows:

- A. Base: Naval Air Station (NAS) Meridian, where the project will be located.
- B. Contracting Officer: A person with the authority to enter into, administer, and/or terminate contracts on behalf of the Nonappropriated Fund Instrumentality, which is party to this contract, and make related determinations and findings.
- C. CNIC: Commander Navy Installation, Command.
- D. Contractor: The person or entity who has been awarded the contract for construction of this project.
- E. COR (Contracting Officer's Representative): The on-site representative of the Contracting Officer with authority to act for the Contracting Officer in areas specified by letter of designation.
- F. CFCI: Contractor-Furnished, Contractor-Installed.
- G. FEAD: Facilities Engineering and Acquisition Division, which is part of the PW/PWD.
- H. The Fund: Refer to NAFI
- I. Government: The term will generally refer to the NAFI or Fund. The use of the term "Government" shall not be construed to infer that appropriated funds of the United States are involved in this project. No appropriated funds of the United States shall become due, or be paid to the Contractor by reason of this contract.
- J. GFCI: Government-Furnished, Contractor-Installed.
- K. GFE: Government-Furnished Equipment (not installed except for utility hook-up, if required).
- L. GFGI: Government-Furnished, Government-Installed.
- M. Installation: Same as "Base".
- N. MWR: Morale, Welfare, and Recreation activity at the Installation. The MWR provides projects in support of Quality of Life enhancements for the authorized patron.
- O. NAFI: Refer to Section I-2.
- P. Offeror: The person or entity submitting a proposal in response to this RFP. After the contract is awarded, this term will refer to the person or entity that was awarded the contract (the Contractor).
- Q. Product: Design, completed construction, materials, systems and equipment installed in the completed facilities.
- R. Provide: The term "provide" shall be understood to mean "provide complete in place;" that is, "furnish and install."

S. PW: The Navy Public Works Department (PWD) at the Base.

2.3. Correlation and Intent:

- A. Omissions in the RFP of such words and phrases as "the Offeror shall," "shall be," "shall consist of," "as indicated on the drawings," "in accordance with," "shall," "and," "the," etc., are intentional. Such words and phrases shall be supplied by implication.
- B. Whenever the words "necessary," "proper," or words of like effect are used in the RFP with respect to the extent, conduct, or character of work required, they shall mean that the said work shall be carried to the extent, must be conducted in a manner, or be of a character which is "necessary" or "proper" under the circumstances in the opinion of the Contracting Officer, and the Contracting Officer's judgment in such matters shall be considered final.

2.4. Validity of Information Provided:

A. Information Verification:

- 1. Offerors shall examine the site and determine for themselves the existing conditions and general character of the site. Claims for additional costs due to conditions that could have been verified by site investigation will not be permitted.
- 2. Sizes, materials, and capacities of existing utility lines may be verified by site investigation or with PW through the Contracting Officer.
- B. Questions regarding design, coordination, or interpretation of RFP requirements during the proposal phase shall be directed to the Contracting Officer:

Contracting Officer:

(b) (6)

Commander Navy Installations Command (N944C1)

5720 Integrity Drive – Bldg. 457

Millington, TN 38055

Phone: 901-(b) (6)

FAX: 901-(b) (6)

E-mail: (b) (6)

- C. Arrangements for a site visit may be made in accordance with Section L. Site visits should be arranged 5 working days in advance of the intended date.
- D. A Pre-Proposal meeting, which will include a site visit, will be scheduled and held at the Installation. See Section L, for additional information concerning the pre-proposal conference.

3. SITE INFORMATION

3.1. Property: The project site is located to the west of the airfield. It is off of Allen Road and north of Rabbit Road, and immediately west of Beatrice Lake.

3.2. Topography:

A. The site is basically flat and currently includes the existing clubhouse.

3.3. Soils:

A. A subsurface soils investigation report is provided in section J for information only.

3.4. Environmental Issues:

A. There are no known archaeological sites, jurisdictional wetlands, or threatened or endangered species habitats at the site.

3.5. Utilities:

A. Electrical service is PPV by EMEPA. POC is (b) (6) (601 (b) (6)). EMEPA must be contacted to coordinate all work up to secondary side of transformers and up to weatherhead for overhead electrical feed. Costs to be paid to EMEPA by contractor. EMEPA must also establish temporary power as required. Contractor shall be responsible for this cost as well.

B. The Contractor shall retain a local utility locate firm to locate underground utilities at or adjacent to the site

4. GENERAL CONSTRUCTION REQUIREMENTS

4.1. Comply with the requirements of Section H PRODUCTS AND SUBSTITUTIONS.

5. CODES AND STANDARDS

5.1 The project shall be designed and constructed in accordance with the applicable codes, standards, design parameters or regulations noted in this section, other sections of the RFP, or local, state or federal statutes. In case of conflict between codes, standards, or regulations, the KO will determine which requirement shall apply.

5.2 The reference of any code or standard listed below to the "Authority Having Jurisdiction" (AHJ) or "governmental authority" shall be interpreted to refer to the Contracting Officer as being the authority for code interpretation.

5.3 Reference to standard specifications of any technical society, organization, associations, or to codes, manuals, or regulations of Federal, State, or local AHJ's shall mean the latest standard, code, manual, regulation, specification, or tentative specification adopted and published at least 30 days prior to submittal of offers, unless specifically stated otherwise.

5.4 The project shall comply with the latest EPA.

6. BASIC REQUIREMENTS

6.1 General: Design and construction shall be in accordance with the most stringent requirements of all Federal, State, and Local codes, standards, and regulations (including, but not limited to, the following):

A. Building Code and General Building Construction: International Building Code 2006 Edition w/State of Washington supplement, 2009 Amendment and The Unified Facilities Criteria UFC 1-200-01

B. Barrier-free design should be in accordance with the requirements of the DEPSECDEF Memorandum "Access for People With Disabilities" dated Oct 31, 2008. The memorandum updates the DoD standards for making facilities accessible to people with disabilities. The US Access Board issued an update of the accessibility guidelines which

the DEPSECDEF Memorandum implements with military unique requirements specified in the memorandum attachment. The new “DoD ABA (Architectural Barriers Act) Accessibility Standard” and the DEPSECDEF Memorandum are located at:

<http://www.access-board.gov/ada%2Daba/aba-standards-dod.cfm./6/>.

Architectural Barriers Act of 1968
Office of Technical and Information Services
Architectural and Transportation Barriers Compliance Board
1331 F Street, NW
Suite 1000
Washington, D.C. 20004-1111
Phone: (202) 272-0020 (Voice), (202) 272-0082 (TTY)
Email: ta@access-board.gov

- (1) Uniform Federal Accessibility Standards (UFAS), published as Federal Standard (FED-STD)-79,
 - (2) 28 CFR Part 36, the Americans With Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)
 - (3) And other accessibility requirements in UFC 4-470-14
- C. Antiterrorism Standard UFC 4-010-01 and 02
- D. Plumbing Codes: UFC 3-420-01 Plumbing Systems, 25 October 2004 and International Plumbing Code, 2006 Edition.
- E. Mechanical Codes: UFC 4-101-01 DoD Minimum Antiterrorism Standards for Buildings, 22 January 2007, and UFC 3-410-02N Heating, Ventilating, Air Conditioning and Dehumidifying Systems, 08 June 2005 and International Mechanical Code, 2006 Edition
- F. Electrical Codes: UFC 3-500-01, NFPA 70 and National Electric Code, 2005
- G. Government Criteria: All construction shall be in compliance with all:
- (1) Public Laws (P.L.)
 - (2) Executive Orders (E.O.)
 - (3) Code of Federal Regulations (CFR)
 - (4) Department of Defense Instructions (DODI)
 - (5) Department of Defense Directives (DODD) or other higher authority documents as applicable, as listed in MIL-STD-3007F Appendix B
- I. Fire Protection and Life Safety: UFC-3-600-01 Fire Protection Engineering for Facilities, 26 September 2006; NFPA 13, 20, 24, 72, 80, 90A, 96; and NFPA 101 Life Safety Code, 2006.
- J. Safety and Accident Prevention: OSHA and Corps of Engineers Safety Manual EM-385-1-1. Refer to Section H for additional details. Contractor shall maintain a copy of the COE Safety Manual at the work site at all times.
- K. Energy Code: UFC 3-400-01 Energy Conservation, 5 July 2002, Washington State Energy Code and Energy Policy Act of 2005.
- L. Sustainability: Memorandum of Understanding for High Performance & Sustainable

Buildings, 24 January 2006 and in accordance with the latest instruction or policy statement issued by the Navy.

- M. Design Energy Target Reductions, NAVFAC Interim Technical Guidance.

6.2 Civil

- A. Exterior water lines shall meet AWWA specifications as well as all local and State codes for the service required.
- B. Sanitary sewers shall be installed in accordance with all Federal, State, and local regulations.
- C. Storm water and erosion control plans shall be in compliance with the requirements of the State of Mississippi Department of Environmental Quality and Section J-1 of the RFP.

6.3 Structural: In addition to the general requirements stated above, structural design shall meet the latest editions of the following codes, standards, and specifications:

- A. American Concrete Institute (ACI), "ACI 318, Building Code Requirements for Reinforced Concrete"
- B. American Institute of Steel Construction (AISC), "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings"
- C. American Iron and Steel Institute (AISI), "Specifications of the Design of Cold Formed Steel Structural Members"
- D. American National Standards Institute (ANSI), "American Standard Building Code Requirements for Reinforced Masonry"
- E. American National Standards Institute, ANSI-58.1
- F. American Welding Society (AWS), "Structural Welding Code"
- G. National Concrete Masonry Association (NCMA), "Specifications for the Design and Construction of Load Bearing Concrete Masonry"
- H. National Forest Products Association, "National Design Specifications for Stress Grade Lumber and Its Fastenings"
- I. Steel Deck Institute (SDI), "Publication 2611"
- J. Steel Joist Institute (SJI), "Standard Specifications and Load Tables, Open Web Steel Joists and Long-Span Steel Joists" and similar publications covering deep, long span steel joists.

6.4 Mechanical

- A. Interior water lines shall meet ASME requirements for the service required.
- B. All mechanical equipment provided, furnished and installed shall comply with local

codes and ordinances in addition to Codes listed above.

- C. Energy Utilization shall comply with the requirements of ASHRAE 90.1-2007 and the Mississippi State Energy Code in addition to Codes listed above.

2.5 Electrical:

- A. Electrical equipment shall conform to the applicable requirements of the American Institute of Electrical Engineers, American National Standards Association, National Electrical Manufacturers Association and Underwriters Laboratories, Inc.

END OF SECTION

(NOTE: SECTION D: PACKAGING AND MARKING - NOT USED)

SECTION E

INSPECTION AND ACCEPTANCE

- E-1 INSPECTION OF CONSTRUCTION**
- E-2 PRE-FINAL AND FINAL INSPECTION**
- E-3 INSPECTION OF SERVICES**

E-1 INSPECTION OF CONSTRUCTION

A. Definition. "Work" includes, but is not limited to materials, workmanship, and manufacture and fabrication of components.

B. The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under this contract conforms to contract requirements. The contractor shall maintain complete inspection records and make them available to the NAFI. All work shall be conducted under the general direction of the Contracting Officer and is subject to NAFI inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

C. NAFI inspections and tests are for the sole benefit of the NAFI and do not-

1. Relieve the Contractor of responsibility for providing adequate quality control measures;
2. Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;
3. Constitute or imply acceptance; or
4. Affect the continuing rights of the NAFI after acceptance of the completed work under paragraph (I) below.

D. The presence or absence of a NAFI or Government inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Contracting Officer's written authorization.

E. The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonable needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The NAFI may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. The NAFI shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full-size, and performance tests shall be performed as described in the contract.

F. The Contractor shall, without charge, replace or correct work found by the NAFI not to conform to contract requirements, unless in the public interest the NAFI consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

G. If the Contractor does not promptly replace or correct rejected work, the NAFI may

1. By contract or otherwise, replace or correct the work and charge the cost to the Contractor or
2. Terminate for default the Contractor's right to proceed.

H. If, before acceptance of the entire work, the NAFI decides to examine already completed work by moving it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material for such effort. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the

examination and of satisfactory reconstruction. However, if the work is found to meet contract requirements, the Contracting Officer shall make an equitable adjustment for the additional services involved in the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

I. Unless otherwise specified in the contract, the NAFI shall accept, as promptly as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the NAFI's rights under any warranty or guarantee.

E-2 PRE-FINAL AND FINAL INSPECTION

A. Pre-Final Inspection:

1. In addition to the requirements in Section E-1 above, the Contracting Officer or his authorized representative and technical representatives will jointly conduct a pre-final inspection prior to a final inspection of the facility.
2. The Contractor shall notify the Contracting Officer in writing when the entire project has been inspected by his quality control team and the project is ready for the Contracting Officer or his authorized representative pre-final inspection. With this notification, the Contractor shall prepare and submit a list of items to be corrected or completed.
3. Upon completion of the Pre-final inspection, the Contracting Officer will transmit a punch list report to the Contractor listing discrepancies requiring correction or completion and establishing a for the final inspection. Upon receipt of the punch list, the contractor shall within seven (7) days advise the Contracting Officer of any questions that he or any of his subcontractors may have concerning the requirements of the report.

B. Final Inspection:

1. When all pre-final inspection discrepancies have been corrected, the Contractor shall submit a request for final inspection to the Contracting Officer at least fourteen (14) days before the desired date of inspection.
2. The Contracting Officer or his authorized representative will conduct the final inspection with his Technical Representative(s) and the Contractor with any needed subcontractor in an effort to determine whether the project can be finally accepted upon written notice from the Contractor after the re-inspection punch list items are complete.

C. Re-Inspection:

1. If, upon the first re-inspection, it is found that punch list items or other discrepancies are not sufficiently complete that the Project can be finally accepted, the Contractor shall be responsible for the NAFI's costs for additional technical services for preparation of a new punch list and any subsequent re-inspection prior to final acceptance. The NAFI's costs for additional services will be charged to the Contractor through an appropriate change order to recover applicable reimbursable expenses for activities involved in the re-inspection (this included but is not limited to, A-E expenses, per diem, travel, and labor) incurred by the NAFI.

2. Upon written notice from the Contractor that the re-inspection punch list items are complete, the Contracting Officer or his authorized representative will conduct the final inspection to verify that the discrepancies have been completed and determine whether the project can be finally accepted.

E-3 INSPECTION OF SERVICES

A. The Contractor shall provide and maintain an inspection system acceptable to the NAFI covering the services under this contract. Complete records of all inspection work performed by the Contractor shall be maintained and made available to the NAFI during contract performance and for as long afterwards as the contract requires.

B. The NAFI has the right to inspect and test all services called for by the contract, to the extent practicable at all times and places during the term of the contract. The NAFI shall perform inspections and tests in a manner that will not unduly delay the work.

C. If the NAFI performs inspections or tests on the premises of the Contractor or a subcontractor, the Contractor shall furnish, and shall require subcontractors to furnish, at no increase in contract price, all reasonable facilities and assistance for the safe and convenient performance of these duties.

D. If any of the services do not conform to contract requirements, the NAFI may require the Contractor to perform the services again in conformity with contract requirements, at no increase in contract amount. When the defects in services cannot be corrected by re-performance, the NAFI may-

1. Require the Contractor to take necessary action to ensure that future performance conforms to contract requirements; and
2. Reduce the contract price to reflect the reduced value of the services performed.

E. If the Contractor fails to promptly perform the services again or to take the necessary action to ensure future performance in conformity with contract requirements, the NAFI may-

1. By contract or otherwise, perform the services and charge to the Contractor any cost incurred by the NAFI that is directly related to the performance of such service; or
2. Terminate the contract for default.

END OF SECTION E

SECTION F

DELIVERIES OR PERFORMANCE

F-1 COMPLETION TIME

F-2 LIQUIDATED DAMAGES

F-3 PERFORMANCE EVALUATION OF THE CONTRACTOR

F-1 COMPLETION TIME

The Contractor shall complete the work within the proposed time periods as outlined in Section B of the Contractor's Proposal as accepted and agreed to by the NAFI.

F-2 LIQUIDATED DAMAGES:

A. If the Contractor fails to complete the work within the time specified in the contract, or any extension, the Contractor shall pay liquidated damages to the NAFI in the amount of **\$483.00** for each calendar day of delay until the work is completed and accepted.

B. If the NAFI terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of re-procurement under the Termination clause.

F-3 PERFORMANCE EVALUATION OF THE CONTRACTOR:

A. As a minimum, the Contractor's performance will be evaluated upon final acceptance of the work. However, interim evaluation may be prepared at any time during contract performance when determined to be in the best interest of the NAFI.

B. The contractor will be rated outstanding, above satisfactory, satisfactory, marginal, or unsatisfactory in the areas of Contractor Quality Control, Timely Performance, Effectiveness of Management, Compliance with Labor Standards, and Compliance with Safety Standards. The Contractor will be advised of any unsatisfactory rating in the overall rating, and any overall comments will be made a part of the official record. Performance evaluation reports will be available to all DOD Contracting Offices for their future use in determining Contractor responsibility.

END OF SECTION F

SECTION G

CONTRACT ADMINISTRATION DATA

- G-1 ADDRESS FOR PAYMENT**
- G-2 INVOICES AND PAYMENTS**
- G-3 CONTRACT ADMINISTRATION**
- G-4 MANDATORY INFORMATION FOR ELECTRONIC FUNDS TRANSFER**
- G-5 EFT VENDOR PAYMENT ENROLLMENT FORM**
- G-6 CONTRACTING OFFICER'S REPRESENTATIVE DESIGNATION**
- G-7 RETAINAGE STATEMENT**

G-1 ADDRESS FOR PAYMENT

A. Contractor is requested to indicate below the address to which payment should be mailed, if such address is different from the one shown on page one (SF33) of this contract.

(Name) _____
(Street Address) _____
(City, State, Zip) _____
(Area Code)(Telephone Number) _____

G-2 INVOICES AND PAYMENTS

A. Progress payments to the Contractor are authorized on a monthly basis in accordance with Section I, Contract Clause I-74, entitled Payments under Fixed-Price Construction Contracts. The Contractor shall submit the following itemized applications for payment, using AIA Form G-702 and G-703,

1. The original and two copies of all invoices shall be furnished to:

CNIC, FACILITIES AND ACQUISITION
ATTN: (b) (6) (N944S1)
5720 INTEGRITY DRIVE, BLDG 457
MILLINGTON, TN 38055-6560

Tel: 901-(b) (6) DSN: 882-(b) (6)
FAX: 901-(b) (6) DSN: 882-(b) (6)
E-mail: (b) (6)

2. One copy shall be furnished to the FEAD:

(b) (6)
229 ALLEN ROAD
MERIDIAN, MS 39309
Tel: 601-(b) (6)
Email: (b) (6)

- a. The on-site FEAD will review and validate invoices and then forward with comments to the Project Manager.

B. Actual payment for all invoices will be made by:

CNIC, FACILITIES AND ACQUISITION
(b) (6) (N944S1)
5720 INTEGRITY DRIVE, BLDG 457
MILLINGTON, TN 38055-6560
Tel: 901-(b) (6)
FAX: 901-(b) (6)
E-mail: (b) (6)

C. One copy of all invoices shall be sent to the Contracting Officer.

G-3 CONTRACT ADMINISTRATION

A. Contracting Officer: This contract will be administered by a Contracting Officer assigned to the Commander Navy Installations, Command - N944C.

B. Contracting Officer's Authority: The Contracting Officer is the only person authorized to approve changes to any of the requirements under this contract, and notwithstanding any provision contained elsewhere in this contract, said authority remains solely with the Contracting Officer. In the event the Contractor effects any changes at the direction of any person other than the Contracting Officer, the change will be considered to have been without authority and no adjustment will be made in the contract price to cover any increase in charges incurred as a result thereof. The name and address of the Contracting Officer is as follows:

(b) (6), Contracting Officer
Commander, Navy Installations Command (Code N944C1)
5720 Integrity Drive, Bldg 457
Millington, TN 38055

Tel: (901) (b) (6)

FAX: (901) (b) (6)

E-mail: (b) (6)

C. Contracting Officer's Representative: The Contracting Officer may designate one (1) or more Contracting Officer's Representative(s) (COR) for the purpose of surveillance of the contractor's quality control and assurance activities for work being performed under this contract. No inspector or COR is authorized to change the terms and conditions of this contract or any provision of the specifications nor shall the presence or absence of an inspector or COR relieve the Contractor from any requirements of the contract.

G-4 MANDATORY INFORMATION FOR ELECTRONIC FUNDS TRANSFER

A. Method of Payment. All payments by the NAFI under this contract shall be made by electronic funds transfer (EFT), except as provided in paragraph (b) of this clause.

B. Exceptions to the EFT are as follows:

1. Contracts awarded to companies located OCONUS
2. Contracts denominated or paid in other than U.S. currency
3. Classified contracts when such payments would compromise national security
4. Contracts executed by deployed Contracting Officers in the course of military operations
5. Contracts executed by any Contracting Officer in the course of emergency operations, e.g., responses to natural disaster or national or civil emergencies

C. Mandatory submission of Contractor's EFT information

1. The contractor is required to provide the payment office with information required to make payment by EFT on form in Section J.

2. Any changes to the contractor's original information, to include the closure of account, must be provided to the payment office at least 30 days prior to the effective date of payment

D. Mechanisms for EFT payment. The NAFI may make payments by EFT through the Automated Clearing House (ACH) network, subject to the rules of the National Automated Clearing House Association.

E. Suspension of payment

1. The NAFI is not required to make any payment under this contract until after receipt by the designated office of the correct EFT payment information from the contractor. Until receipt of the correct EFT information, any invoice or contract financing request shall be deemed not to be a proper invoice for the purpose of prompt payment under this contract. The prompt payment terms of the contract regarding notice of an improper invoice and delays in accrual of interest penalties apply.
2. If the EFT information changes, the NAFI shall begin using the new information no later than 30 days after receipt by the designated office. However, the contractor may request that no further payments be made until the payment office implements the updated EFT information. If such suspension would result in a late payment under the prompt payment terms of this contract, the contractor's request for suspension shall extend the due date for payment by the number of days of the suspension.

F. Liability for uncompleted or erroneous transfers.

1. If an uncompleted or erroneous transfer occurs because the NAFI used the contractor's EFT information incorrectly, the NAFI remains responsible for
 - a. Making a correct payment;
 - b. Paying any prompt payment penalty due; and
 - c. Recovering any erroneously directed funds.
2. If an uncompleted or erroneous transfer occurs because the contractor's EFT information was incorrect, and
 - a. If the funds are no longer under the control of the payment office, the NAFI is deemed to have made payment and the contractor is responsible for recovery of any erroneously directed; or
 - b. If the funds remain under the control of the payment office, the NAFI shall not make payment and the provisions of paragraph (e)(2) shall apply.

G. EFT and prompt payment. A payment shall be deemed to have been made in a timely manner in accordance with the prompt payment terms of this contract if the date specified for settlement of the payment is on or before the prompt payment due date.

H. EFT and assignment of claims. If the contractor assigns the proceeds of this contract as provided for in the assignment of claims terms of this contract, the contractor shall require as a condition of any such assignment, that the assignee shall provide the EFT information required by paragraph (c) of this clause to the designated office, and shall be paid by EFT in accordance with the terms of this clause. In all respects, the requirements of this clause shall apply to the assignee as if it were the contractor.

I. Liability for change of EFT information by financial agent. The NAFI is not liable for errors resulting from changes to EFT information provided by the contractor's financial agent.

G-5 EFT VENDOR PAYMENT ENROLLMENT FORM

It is mandatory that the awarded contractor complete and return the form in Section J for electronic deposits. The contractor is not required to provide the signature of the official nor the title of the official on the form. For more detailed information, please call Resource Manager, (901) (b) (6).

G-6 CONTRACTING OFFICER'S REPRESENTATIVE DESIGNATION: TBD

G-7 RETAINAGE STATEMENT

The NAFI will retain 10% of all payments until final inspection. Once all punch list items are completed including delivery of complete Operation and Maintenance Manual and As-Built Drawings, the Contractor may invoice for the final release of the monies being retained on this project.

END OF SECTION

SECTION H

SPECIAL CONTRACT REQUIREMENTS

- H-1 STATEMENT OF INTENT**
- H-2 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER**
- H-3 PROJECT SIGNAGE**
- H-4 BULLETIN BOARD**
- H-5 SCHEDULED OUTAGES**
- H-6 CONTRACTOR'S AREA USE PLAN**
- H-7 CONSTRUCTION DEBRIS REMOVAL AND DISPOSAL**
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- H-10 REQUIRED INSURANCE**
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- H-23 SYSTEMS DEMONSTRATION**
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- H-26 CONTRACTOR QUALITY CONTROL/QUALITY ASSURANCE**
- H-27 NOT USED**
- H-28 KEY PERSONNEL**
- H-29 PRODUCTS AND SUBSTITUTIONS**
- H-30 TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY
(DD FORM 1354)**

H-1 STATEMENT OF INTENT: It is the declared and acknowledged intention and meaning to obtain a complete and useable, aesthetically pleasing facility. The facility is to be of standard commercial quality, which will operate efficiently and remain free of unreasonable failure and defects throughout its intended life span of 30 years. This is a Navy Nonappropriated Fund Instrumentality (NAFI) procurement and is not funded by any Appropriated Funds of the United States. No appropriated funds of the United States shall be obligated, due or payable as a result of this contract.

H-2 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER: This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the contract clause entitled "Default (Fixed-Price Construction)." The Contractor shall ensure that the project schedule allows for normal weather patterns in the geographic area in which the work will be performed. The National Oceanic and Atmospheric Administration (NOAA) may provide some information for the geographic location of the project and usual weather patterns. Unless the contractor can prove to the Contracting Officer's satisfaction that extreme unusual weather patterns were encountered during the construction phases of the project and that this extremely unusually weather could not reasonably have been expected to occur or avoided, claims for weather related delays will not be approved.

H-3 PROJECT SIGNAGE: The Contractor shall furnish and install a project sign at the location selected by the Contracting Officer or the duly appointed representative. The sign layout shall be in accordance with the graphic format provided in Section J.

H-4 BULLETIN BOARD: Immediately upon beginning of work under this contract, the Contractor shall provide at the job site a weatherproof glass covered bulletin board for displaying the fair employment poster, wage rates, and safety bulletins and posters. Emergency telephone numbers and reporting instructions for ambulance, physician, hospital, fire and police shall be posted. The bulletin board shall be located in a conspicuous place easily accessible to all workers at the job site, including the public. Legible copies of the aforementioned data shall be displayed until all work under the contract is completed.

H-5 SCHEDULED OUTAGES

A. All outages, including but not limited to utility interruptions and road closures, shall be of as short in duration as possible and shall be requested by the Contractor in writing, as far in advance as possible with the COR. In no case shall scheduling occur less than fifteen (15) days prior to the required outage. The Contractor shall obtain required utility outage request forms from the COR and the Contractor shall include the following:

1. Type of utility, access or service to be disrupted
2. Areas and/or facilities affected
3. Expected duration of outage
4. Date of proposed outage
5. Names of authorized personnel
6. Point of contact and telephone numbers

B. The Contractor shall obtain in writing from the COR a statement of schedule, giving the permissible times of outages for particular installations or activities and the maximum time allowed for each outage. Any utility outage expected to exceed one (1) hour in duration shall be scheduled for the weekend (Saturday/ Sunday) and shall not exceed six (6) hours in duration. No outage shall occur until written approval is received from the Contracting Officer. The Contractor shall strictly observe such schedules and will be held responsible for any violations. The Contractor shall include with each outage request a list or bill of materials and equipment that will be used during said outage. The Contractor will be solely responsible for ensuring that all materials and equipment will be on hand and ready for use during any scheduled outage.

H-6 CONTRACTOR'S AREA USE PLAN

A. The Contractor shall submit an Area Use Plan to the COR, for approval, within thirty (30) days after receipt of Notice to Proceed. The Area Use Plan shall show the following:

1. Location of Contractor sheds and trailers
2. Location of all Contractor storage areas
3. Location of Contractor staging areas
4. Temporary utility tie-ins
5. Location of required Contractor security fencing.
6. Required telephone service and locations

H-7 CONSTRUCTION DEBRIS REMOVAL AND DISPOSAL: The construction refuse materials shall be disposed of off the installation in a manner that meets all federal, state and local legal requirements. Disposal of construction refuse material is the obligation of the Contractor and neither the installation nor any of the Navy refuse disposal resources shall be used. The Contractor is responsible for the removal of all refuse and packing materials in Contractor provided dumpsters or trucks. Government dumpsters shall not be used by the Contractor, contractor employees, or subcontractors at any time.

H-8 COORDINATION CONFERENCES: Routine coordination conferences will be scheduled by the Contracting Officer or the duly appointed contracting officer's representative throughout the life of this contract. Coordination conferences will be held to discuss contract administration, Contractor quality control, phasing, scheduling, and other aspects relating to this construction. The Contractor will be required to send a qualified representative to be present at each of these meetings.

H-9 CONTRACTOR MAINTENANCE: At the end of each working day the Contractor shall police the work area and the area immediately surrounding the work area of all work-related debris. The Contractor shall comply with all applicable safety requirements and shall conduct his operations in a manner to ensure an accident-free environment. Stacked materials shall not be within 25 feet of an active roadway.

H-10 REQUIRED INSURANCE

A. In accordance with Section I, Contract Clause I-19, the Contractor shall procure and maintain during the entire period of his performance under this contract the following types of insurance; in no less than the minimum amounts set forth herein:

1. Workman's Compensation and all occupational diseases --- As required by State law.
2. Employer's liability including all occupational diseases when not so covered in Workman's Compensation above --- \$100,000 per accident.
3. General Liability (Comprehensive Bodily Injury and Property Damage) --- \$2,000,000.00
4. Automobile Liability (Comprehensive)

Bodily Injury per person -----	\$200,000
Bodily Injury per occurrence -----	\$500,000
Property Damage per accident -----	\$ 20,000

B. The Contractor shall be fully responsible to the NAFI for his associates and subcontractors under this contract.

C. Each certificate of insurance shall list the NAFI which is a party to this contract as an additionally insured party. Prior to the commencement of work hereunder, the Contractor shall furnish to the Contracting Officer a certificate or written statement of the above required insurance. The policies evidencing required insurance shall contain an endorsement to the effect that cancellation or any material change in the policies adversely affecting the interest of the NAFI in such insurance shall not be effective for such period as may be prescribed by the laws of the State in which this contract is to be performed and in no event less than thirty (30) days after written notice thereof to the Contracting Officer.

H-11 PHYSICAL DATA: Data and information furnished or referred to below are furnished for the Contractor's information. The NAFI will not be responsible for and interpretation or conclusion drawn from the data or information by the Contractor.

A. Physical conditions when indicated on the drawings and in the specifications are the result of site investigations, by surveys, borings, test pits and probings. The contractor shall also verify all measurements provided as any such information provided in the contract is for reference only and may not be the actual measurements, quantities, load or other descriptor so provided.

B. Weather Conditions: The Contractor shall make his own investigations as to weather conditions at the site. Data may be obtained from various National Weather Service offices located generally at airports of principal cities. Historical data for all areas may be obtained from the U.S. Department of Commerce. The contractor should check with the office nearest to the project work site. NOAA may also have useful information for the contractor's consideration.

C. Transportation Facilities: Access ways shall be investigated by the Contractor to satisfy their existence and allowable use by the Contractor.

H-12 RESPONSIBILITY OF THE CONTRACTOR (NOT USED)

H-13 DESIGN DISCREPANCIES: (NOT USED)

H-14 SAFETY

A. The Contractor shall comply with OSHA (Occupational Safety and Health Act) Standards for design and construction of this facility and the latest edition of the US Army Corps of Engineers' SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1. Safety and Occupational Health Requirements shall be per UFGS 01525. The SSHO shall meet the Level 3 requirements, with competent person status for Fall Protection, Scaffolding, Hazardous Energy, and Cranes. Also see Section I, clause entitled ACCIDENT PREVENTION, FIRE PROTECTION, AND SANITATION.

B. Within 14 days from notice to proceed, The contractor shall provide the COR a comprehensive Construction Safety plan to cover all safety requirements associated with this project. Include in the safety plan the name of the individual responsible for daily safety inspections and taking corrective action.

C. The safety plan shall include a list of all hazardous chemicals and their Material Safety Data Sheets (MSDS) that will be used during construction.

D. The safety plan shall include a list of all hazardous waste (defined in 40 CFR, Part 261) and estimated quantities that will be generated during the work of this project. Include contact information and certifications for the organizations that will transport and dispose of hazardous wastes generated. If the contractor determines that no hazardous waste will be generated during the work of this project, the contractor shall include a statement to that effect with the Safety Plan.

E. The Contractor's Construction Safety plan for this project shall specifically address safety measures to be taken during connection operations for all utility systems. Coordinate with the Contracting Officer's Representative regarding known hazards associated with this operation and preventative measures to be taken.

H-15 ARCHAEOLOGICAL FINDINGS DURING CONSTRUCTION: There are no known archaeological remains at the project site. Should any skeletons, artifacts, or other archaeological remains be uncovered, the Contractor shall suspend operations at the site of discovery and continue operations in other areas. The Contractor shall notify the Contracting Officer's Representative and the Contracting Officer immediately of the finding. Included with the notification shall be a brief statement to the Contracting Officer of the location and the findings. Should the discovery site require archaeological studies resulting in delays and/or additional work, the Contractor will be compensated by an adjustment under Section I of the contract.

H-16 RECORD (AS-BUILT) DRAWINGS

A. At least 14 days prior to the pre-final inspection, the Contractor shall prepare and submit to the Contracting Officer two (2) full size and three (3) half size bound copies of the complete set of as-built project drawings on bond paper, five (5) copies of the specifications in 3-ring binders, and five (5) virus-free CDs of the electronic as-built drawings (AutoCAD version 2006) and specifications (in latest version of MS Word) along with a PDF of the complete set of as-built drawings and specifications. Documents shall be neatly marked to show an accurate "as-built" record of construction. If the "as-built" drawings have to be redone as a result of the pre-final inspection, the Contractor shall prepare and submit new "as-builts" to the Contracting Officer. **Final payment is contingent upon completion of the "as-built" drawings.**

1. Changes and corrections entered on the documents shall be indicated by a lettered circle and noted as "Record Drawings" in the revision space provided. If no revisions or corrections are

necessary individual drawings, insert the notation "Record Drawing - No Changes" in or below the revision block.

2. Neatly mark specifications to indicate names of products and manufacturers incorporated in the project.

B. The Contractor shall carefully mark drawings during construction to accurately locate elements that will be concealed when the project is completed. Contractor shall carefully measure and show dimensions of all concealed work including, but not limited to, piping, electrical services, and conduit.

C. The As-Built drawings shall also show the location and description of any utility lines or other installations known to exist within the construction area. The location and description of exterior utilities, including measured horizontal distances from utilities to permanent facilities/features shall be shown. Measurements shall be within an accuracy range of six (6") inches and shall be shown at sufficient points to permit easy location of utilities for future maintenance purposes. Measurements shall show all change-in-direction points and all surface and underground components (i.e., valves, manholes, drop inlets, cleanouts, meters, etc.). The general depth range of each underground utility line shall be shown (i.e., 3' - 4' depth, etc.). A complete description of all exterior utilities shall include the actual quantities, sizes, and materials.

H-17 RIGHTS IN SHOP DRAWINGS

A. The term "shop drawings" for construction means drawings, submitted by the construction Contractor, subcontractor or any lower-tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials or equipment. The NAFI may obtain, duplicate, use, and disclose in any manner and for any purpose shop drawings developed and used in the performance of this contract.

B. This clause, including this paragraph b, shall be included in all subcontracts hereunder at any tier.

H-18 NAFI RIGHTS (UNLIMITED) IN DATA -- SPECIAL WORKS

A. Definitions. As used in this clause--

"Data" means recorded information, regardless of form or the medium on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

"Unlimited rights" means the rights of the NAFI to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

B. Allocation of Rights.

1. The NAFI shall have-
 - a. Unlimited rights in all data delivered under this contract, and in all data first produced in the performance of this contract, except as provided in paragraph "C" of this clause for copyright.

- b. The right to limit assertion of copyright in data first produced in the performance of this contract, and to obtain assignment of copyright in that data, in accordance with paragraph “C.1” of this clause.
 - c. The right to limit the release and use of certain data in accordance with paragraph “D” of this clause.
 2. The Contractor shall have, to the extent permission is granted in accordance with paragraph “C.1” of this clause, the right to assert claim to copyright subsisting in data first produced in the performance of this contract.

C. Copyright-

1. Data first produced in the performance of this contract.
 - a. The Contractor shall not assert or authorize others to assert any claim to copyright subsisting in any data first produced in the performance of this contract without prior written permission of the Contracting Officer. When copyright is asserted, the Contractor shall affix the appropriate copyright notice of 17 U.S.C. 401 or 402 and acknowledgment of NAFI sponsorship (including contract number) to the data when delivered to the NAFI, as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. The Contractor shall grant to the NAFI, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license for all delivered data enabling the NAFI or others on behalf of the NAFI to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly.
 - b. If the NAFI desires to obtain copyright in data first produced in the performance of this contract and permission has not been granted as set forth in paragraph (c)(1)(a) of this clause, the Contracting Officer shall direct the Contractor to assign (with or without registration), or obtain the assignment of, the copyright to the NAFI or its designated assignee.
 - c. The Contractor, for a period of three (3) years after completion of the contract/project, agrees to furnish the original or copies of all such works on the request of the Contracting Officer.
2. Data not first produced in the performance of this contract. The Contractor shall not, without prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract and which contain the copyright notice of 17 U.S.C. 401 or 402, unless the Contractor identifies such data and grants to the NAFI, or acquires on its behalf, a license of the same scope as set forth in subparagraph (c)(1) of this clause.

D. Release and use restrictions. Except as otherwise specifically provided for in this contract, the Contractor shall not use, release, reproduce, distribute, or publish any data first produced in the performance of this contract, nor authorize others to do so, without written permission of the Contracting Officer.

E. Indemnity. The Contractor shall indemnify the NAFI and its officers, agents, and employees acting for the NAFI against any liability, including costs and expenses, incurred as the result of the violation of trade secrets, copyrights, or right of privacy or publicity, arising out of the creation, delivery, publication, or use of any data furnished under this contract; or any libelous or other unlawful matter contained in such data. The provisions of this paragraph do not apply unless the NAFI provides notice to the Contractor as

soon as practicable of any claim or suit, affords the Contractor an opportunity under applicable laws, rules, or regulations to participate in the defense of the claim or suit, and obtains the Contractor's consent to the settlement of any claim or suit other than as required by final decree of a court of competent jurisdiction; and these provisions do not apply to material furnished to the Contractor by the NAFI and incorporated in data to which this clause applies.

H-19 INVENTORY OF INSTALLED EQUIPMENT: A list of equipment or units of equipment that require electrical power or fuel, or may require removal or replacement, such as air handling units (AHU's), fans, air conditioners, compressors, unit kitchens, condensers, boilers, thermal exchanges, pumps, cooling towers, tanks, fire hydrants, etc., shall be made and kept up-to-date as installed. The list will be reviewed periodically by the NAFI to ensure completeness and accuracy. Partial payment may be withheld at the discretion of the Contracting Officer for equipment not incorporated in the list. The list shall include on each item as applicable: description, manufacturer, model or catalog number, serial number, input (power voltage, BTU's, tons, etc.), size or capacity (tanks) and net inventory costs; any other data necessary to describe item. Final list shall be turned over to the authorized representative of the Contracting Officer two (2) weeks prior to final inspection. Provide two disks or CDs with the list in Excel or Access format.

H-20 EXTENDED WARRANTIES: In addition to the requirements outlined in Section I, clause I-34, WARRANTY OF CONSTRUCTION, the Contractor shall provide extended warranties which run from the time of acceptance for the periods indicated in the various technical requirements of Section C.

H-21 SCHEDULE OF VALUES FOR INSTALLED FIXTURES AND FURNISHINGS: The Contractor shall prepare and provide to the Contracting Officer or his authorized representative a schedule of values listing all Contractor furnished and installed fixtures and furnishings. The schedule shall include as applicable: item description; quantity; gross acquisition cost; manufacturer; model or catalog number; and any other data necessary to describe the item. Said schedule shall be included and submitted at the 50% and 100% Design Reviews and in all cases not later than two (2) weeks prior to pre-final inspection.

H-22 OPERATION AND MAINTENANCE DATA

A. At least 14 days prior to the final inspection, the Contractor shall prepare and submit to the Contracting Officer three (3) complete sets of information describing the operation and maintenance of all systems and equipment. The information shall be in 8 1/2" x 11" three-ring binders with durable plastic covers with the words "Operation and Maintenance Manual" and the name and address of the project and Contractor neatly and permanently marked on the cover.

B. Information shall be organized and subdivided in sections on the basis of operation without regard to construction trades, subcontractors, or specification sections. Each section shall be neatly tabbed and identified for easy reference.

C. The operation and maintenance manuals shall contain, as a minimum:

1. Complete list of subcontractors noting applicable specification section, item of work, subcontractor's name, address, telephone number, and the name of the person to contact.
2. Special instructions for reporting all warranty issues to the appropriate point of contact, whether directly to a subcontractor, the general contractor or a manufacturer. Following these instructions will in no way void the general or extended warranties afforded under this contract.

3. Schedule of values of construction work incorporating costs of any change orders.
4. Manufacturer's recommendations for operation and maintenance of all equipment and systems including charts, diagrams, performance curves, catalog data, and maintenance manuals.
5. Manufacturer's recommendations for use and maintenance of all finish materials.
6. Original and one copy of all warranties, guarantees, and bonds.

H-23 SYSTEMS DEMONSTRATION

A. Prior to final inspection the Contractor shall demonstrate the operation of each mechanical, electrical, plumbing, communication, equipment and specialties system to the Contracting Officer and/or his representatives. The Contractor shall also instruct the Government, the MWR, and the PWD personnel in the operation, adjustment and maintenance of all equipment and systems using the operation and maintenance manual as the training basis.

B. Upon completion of the training session, the Contractor shall prepare a certificate indicating the date of instruction, the system or equipment involved, and a statement that the instruction was sufficient to explain the requirements for proper operation and/or maintenance. The certificate shall be signed by the Contractor, the individual providing the instruction, and the Government or the MWR, the PWD personnel receiving the instruction. These certificates shall be submitted to the Contracting Officer with the Contractor's application for final payment.

H-24 CONTRACTOR-PREPARED PROGRESS SCHEDULE

A. In accordance with Section I, Clause I-52, "Schedules for Construction Contracts," the Contractor shall submit as part of his initial design submittal, a critical path progress schedule showing the manner in which he intends to prosecute the work.

B. Preparation: The progress schedule shall be prepared in the form of time-scaled (Gantt Chart) summary network diagram graphically indicating the sequence proposed to accomplish each work operation and appropriate inter-dependencies between the various activities. The chart shall show the starting and completion dates of all activities on a linear horizontal time scale beginning with the dates of Notice to Proceed and indicating calendar days to completion. Each significant activity in both design and construction phases of the project shall be represented and a cost for the activity indicated. The sum of the activity costs will total to the contract amount for the project. The Contractor shall indicate on the chart the important work activities that are critical to the timely overall completion of the project. Key dates for important features or portions of work features are milestone dates and shall be indicated on the chart. Based on this chart, the Contractor shall prepare an earnings-time curve ("S" curve) showing the rate of progress in terms of money and percent completion. Schedule progress may not include the value of materials or equipment delivered to the job site but not yet incorporated into the work. This schedule shall be the medium through which the timelessness of the Contractor's construction effort is appraised, and periodic payment estimates are processed pursuant to the Contract Clauses.

C. The Contractor shall participate in a review and evaluation of the proposed diagram and analysis with the Contracting Officer. Any revision necessary as a result of this review shall be resubmitted for approval of the Contracting Officer within ten (10) calendar days after the conference. The approved network and mathematical analysis will then be used by the Contractor for planning, organizing and directing the work, for reporting progress and for requesting payment for work accomplished.

D. The initial and subsequent update submittal of the progress schedule shall be summarized on one sheet, maximum size of 30 by 42 inches.

E. Failure by the Contractor to maintain adequate progress in accordance with the progress schedule may result in withholding of progress payments, as determined by the Contracting Officer.

H-25 BASE ACCESS

A. Contractors and subcontractors are required to abide by Department Of Homeland Security requirements for verification of worker employment eligibility. This is in support of detection and apprehension of illegal alien/undocumented workers.

To this end, base access procedures for badge issuance include on-site verification of base sponsorship and supporting documentation.

As of June 1st, 2011, The Government has implemented RAPIDGate base access procedures. Under RAPIDGate, employee badges may be obtained either by visiting the Pass and ID Office daily or utilizing the RADPIDGate Program. The cost of the RAPIDGate program includes a fee for the Contractor's firm and a fee per Contractor employee for use of the program. Contractors who choose not to participate in the program will be required to obtain daily business passes at the pass office. Badges/passes are the property of the Government and shall be displayed as required by the Installation Security Department. RAPIDGate badges remain the property of RAPIDGate, and as such must be returned within two calendar days to the employer when an employee leaves the Contractor's service. It is the sole responsibility of the contractor to see that all badges issued to their employees are returned in accordance with these provisions. Upon expiration of the contract, all employees' passes and badges shall be deactivated and the base access privileges revoked until such time base access is again required/authorized.

Information for this program can be found at:

[http:// www.RAPIDgate.com](http://www.RAPIDgate.com)

Due diligence on your part in screening employees is required because the government is not responsible for work Delays or Stoppages caused by the contractor/sub-contractor's failure to comply with registration and access requirements, nor is the Government responsible for program fees lost due to ineligible personnel.

Also be aware, that the contracting officer is required to consider debarment proceedings where repeated or egregious violations of access control requirements are found.

In addition to these provisions the contractor must also comply with all additional base procedures for applying to obtain commercial passes for entry to this facility.

To obtain additional information regarding base access, please contact the Security department at 601-679-2509.

B. Personnel Access—at a minimum all individuals are subject to screening and must be able to comply with the following criteria:

1. All personnel must be either United States citizens or possess proper alien worker documentation;
2. All personnel are subject to screening as registered sex offenders; and
3. All personnel are subject to screening as unacceptable security risks and criminal background checks.

C. The following documents may be required for in order to obtain a vehicle pass:

1. Valid military or other government issued ID;

2. Valid vehicle registration in ID holder's name;
3. Driver's license; and
4. Acceptable proof of insurance

H-26 CONTRACT QUALITY CONTROL/QUALITY ASSURANCE

A. Definitions

1. Contractor Quality Management System (CQMS): The means by which the Contractor assures himself that his construction complies with the requirements of the contract.
2. Contractor Quality Control (CQC): The Contractor's inspection, examination and control of his own, his suppliers', and his subcontractor's work and activities to ensure compliance with contract requirements.
3. Contractor Quality Assurance (QA): The means by which the Contractor fulfills his responsibility for assuring that the CQC system is functioning effectively.

B. General:

The Contractor shall establish and maintain an effective quality management system in compliance with contract clauses, professionally accepted inspection of construction practices and as herein provided. The CQMS consists of plans, procedures, and organization necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with contract intent and specific requirements. The system shall cover the construction operations, both on site and off site, and shall be keyed to the proposed construction sequence. The Contractor shall designate a Professional Architect or Engineer as the CQMS Chief. The CQMS Chief may appoint different professionals for construction quality control, including a Chief of Construction Quality Control (see Paragraph G.2.a of this clause). The CQMS Chief shall review and certify that all Contractors; quality control activities including reviews, inspections and reports meet the requirements of the Contractor's quality control plan, and that all work is completed in accordance with the RFP design plans and specifications. Quality management personnel shall also be charged with the responsibility for overseeing the Contractor's Safety Program. This duty will be clearly set forth in the Contractor's quality control plan.

C. Coordination Meeting:

As soon as practicable after contract award, the Contractor shall meet with the Contracting Officer's Representative and review and discuss the details of Contractor's Quality Control System. During the meeting, a mutual understanding of the Contractor Quality Control (CQC) system details shall be developed, including the forms for recording the CQC operations; control activities, testing, administration of the system for both on-site and off site, and the interrelationship of Contractor quality control and Government's quality assurance. A letter, signed by an authorized official of the firm, which describes the responsibilities and delegates the authorities of the Chief of Quality Control shall be furnished to the Contracting Officer within 5 calendar days after the meeting. Minutes of the meeting shall be prepared by the Contracting Officer's Representative and shall be signed by both the Contractor and the Contracting Officer's Representative. The minutes of the meeting (which shall include the details of the Contractor's Quality Control Systems) and the Contractor's letter (stated above), and shall become incorporated as part of the contract by supplemental agreement. There may also be occasions when subsequent conferences will be called to reconfirm understandings.

D. Quality Management Plan:

1. The plan shall include as a minimum:
 - a. A description of the quality management organization.
 - b. The number, classifications, qualifications, duties, responsibilities and authorities of personnel.
 - c. Procedures for processing, reviewing, and approving shop drawings, samples, certificates, and other submittals.
 - d. CQC activities to be performed, including those of the subcontractors, off site fabricators and suppliers. Each phase of CQC (preparatory, initial and follow up as hereinafter defined) will be covered for each separate activity.
 - e. Control testing procedures.
 - f. Documentation format for CQC activities and testing.
 - g. Performance testing for acceptance of all facility electrical, mechanical and other systems.
 - h. Review and revise to omit design.

E. Notification of Changes: After acceptance of the CQC plan, the Contractor shall receive the Contracting Officer's approval in writing of any proposed change to his CQC system or CQC personnel.

F. Corrective Actions: At any time it is determined by the Contracting Officer that the CQC system, personnel, instructions, controls, tests or records are not providing design or construction work which conforms to contract requirements, the Contractor will be required to correct the deficiency, i.e., replacement of personnel, additional CQC inspection, etc. in a manner acceptable to the Contracting Officer.

G. Quality Control Organization:

1. Construction:
 - a. Contractor Quality Control (CQC) Chief: **The Contractor shall identify an individual other than the job superintendent**, whose qualifications are subject to approval by the Contracting Officer, who shall be responsible for overall quality control and have the authority to act in all CQC matters for the Contractor. Minimum qualifications will include at least 10 years experience as a general construction superintendent on similar type projects or be a licensed professional engineer or architect. This individual will certify all submittals and CQC approval and disapproval documentation. Replacement of the CQC Chief will be subject to approval of the Contracting Officer and require full justification. No work requiring observation or testing will be conducted unless the CQC Chief is present or unless the Contracting Officer has approved that the work can proceed under inspection by the CQC Chief's designated representative.
 - b. CQC Personnel: The CQC Chief will assign CQC responsibilities in writing with copies to the Contracting Officer. All personnel assigned CQC responsibilities under the Chief shall be fully qualified by experience and technical training to perform their assigned responsibilities. Under no circumstances will CQC personnel report to anyone other than the CQC Chief. The job superintendent will not be assigned CQC functions. **A CQC representative shall be on site whenever work is in progress.**

- c. Procedures: The CQC Chief will ensure that only materials and equipment which comply with contract requirements are purchased and delivered to the job site or used in off site fabrication, unless specific deviations are approved as specified hereinafter.
- d. The CQC Chief or other qualified CQC staff member shall be designated as a Quality Control Specialist for Environmental Controls. The QC specialist shall assist and report to the CQMS Chief and who may perform other QC related duties but must be allowed sufficient time to perform their assigned QC specialist duties. The QC Specialist shall attend a Coordination and Mutual Understand Meeting, QC meetings, and be physically present at the construction site to perform the three phases of control and prepare documentation for each definable feature of work in his area of responsibility at the frequency specified below.
 - (1) Qualifications/Experience: Environment and HAZCOM experience
 - (2) Area of Responsibility: Environmental Coordination and Accumulation Area Management.
 - (3) Frequency: Daily and on each work shift.

H. Submittals: The Contractor shall prepare a submittal register and submit it for approval to the COR prior to start of construction. This register may be modified later with the COR approval. The register will list all proposed submittals and tests for purchased materials, construction and equipment, and the anticipated date of submittal or testing.

I. CQC Plan and Control:

- 1. The Contractor's CQC system plan shall include at least the following three phases of quality control for each major feature of work:
 - a. Preparatory: Include a review of contract requirements to assure that materials, construction methods and equipment conform to contract requirements, and that control testing including procedures is finalized. Include examination of the work area to verify that conditions conform to contract requirements, and determination that required materials are on hand and properly stored. Listed below is a checklist of items to be covered as a minimum:
 - (1) Approved construction plans and specifications
 - (2) Approval of submittals
 - (3) Physical examination of materials
 - (4) Completion of preliminary work
 - (5) Procedures for accomplishing work
 - (6) Review of plans and specifications
 - (7) Safety related issues
 - (8) Testing, i.e. number of tests, when, where, and method of recording
 - b. Initial: Implement the CQC plan and procedures for each major work element. The following steps are suggested as a minimum:
 - (1) Identify full compliance
 - (2) Check preliminary work
 - (3) Establish level of workmanship
 - (4) Apply controls
 - (5) Resolve all differences
 - (6) Check safety

- c. Follow Up: The follow up phase shall be performed continuously to verify that control procedures are providing an end product that complies with contract requirements. Adjustments to control procedures may be required based upon the results of this phase and control testing.

J. Tests:

1. Testing Procedures: The Contractor shall perform tests specified or required to verify that control measures are adequate to provide a product which conforms to contract requirements. Procedures include methods of performing quality control which include that for his subcontractor's work. The Contractor will provide a statement in his Quality Control Plan describing quality control measures to be used in the work described in each technical section of the specifications. All mechanical and electrical testing procedures, specified or required to demonstrate satisfactory system performance, shall be described in the Quality Control Plan in detail and approved prior to performing actual work. Where technical specifications require recording of test data, the proposed test log, including planned duration of test, readings to be taken, and instrumentation to be used, will be made a part of the Quality Control Plan. Appropriate forms shall be used to document each test performed. The Contractor shall procure the services of an industry recognized testing laboratory or he may establish an approved testing laboratory at the project site. A copy of all reports of tests performed by an industry recognized independent laboratory shall be kept on file at the site and made available to the Contracting Officer on request. This requirement is in addition to any requirement elsewhere established and does not reduce reports required elsewhere to be submitted or the number thereof. A list of tests to be performed shall be furnished to the Contracting Officer. The list shall give the test name, specification paragraph containing the test requirements, and the personnel and laboratory responsible for each type of test. The Contractor shall perform the following activities and record and provide the following data as a minimum:
 - a. Verify that testing procedures comply with contract requirements.
 - b. Verify that facilities and testing equipment are available and comply with testing standards.
 - c. Check test instrument calibration data against certified standards.
 - d. Verify that recording forms, including all of the test documentation requirements, have been prepared.

K. Defective Work: The Contractor shall not build upon or conceal defective work.

L. Acceptance Inspections:

1. At specified milestones in the work, the CQC Chief together with the Contracting Officer or designated representative shall conduct a construction quality acceptance review. During this review, the work shall be examined, quality control shall be reviewed, and a list shall be developed of work not properly completed or not conforming to plans and specifications. This list shall be included in the quality control documentation with an estimated date for correction of each deficiency. The Contractor shall make sure that deficiencies have been corrected prior to the specified completion date and prior to the Government's final acceptance inspection. Upon correction of nonconforming work the Contractor's Architect of Record shall certify in writing to the Contracting Officer that all work completed to date is in accordance with the plans and specifications. Payment will be withheld for defective or deficient features until they are satisfactorily corrected except as otherwise provided in the contract clause E-1, INSPECTION OF CONSTRUCTION.

2. The specified milestones and review participants shall include as a minimum:
 - a. Building: at 50% and 100% completion stages work shall be reviewed by the CQC Chief, and the Contracting Officer or designated representative .
 - b. Site Work: at completion of rough grading, roadway subgrade preparation, and at installation of underground utilities prior to backfilling the work shall be reviewed by the CQC chief and the Architect/Engineer of record including civil, mechanical, and electrical engineering disciplines.

M. Documentation:

1. The Contractor shall maintain current records, on an appropriate accepted form, of quality control operations, activities, and tests performed including the work of suppliers and subcontractors. These records shall include factual evidence that the required activities or tests have been performed, including but not limited to the following:
 - a. Contractor Quality Control (CQC) Reports: The specified reports must be completed no later than 10:00 a.m. the following workday and must be factual records of the Contractor's daily quality control activities and resulting actions. As such, they should include the following as major components of the report:
 - (1) Construction underway during the time frame of the report (i.e., earthwork, CMU construction, concrete work, etc.).
 - (2) Phase (preparatory, initial, follow up), and locations of control activities and/or check tests that were made. As a minimum, the reports shall address items noted under paragraphs "I.(1)(a) and (b)" of this clause.
 - (3) Results of control activities, including control actions taken, nature of deficiencies observed, and corrective actions taken or to be taken. If no activities are listed on the report, it must be assumed that no work was underway or no control activities were accomplished and that CQC is not being implemented.
 - (4) Report of tests performed, with the results of the tests, including failures and remedial action to be taken. Test results, including all computations, should be attached to the report form. Where test results cannot be completed by the time the report is submitted, a notation should be made that the test was performed and the approximate date test results will be available. Delayed test results should be submitted with the report form on the date received.
 - (5) Actions taken in review of submittals, including submittals approved and delays or predicted delays caused by a lack of submittal actions. (This can be included on the marked-up submittal schedule if all information can be included to show adequate management of submittals.)
 - (6) Monitoring of materials and equipment for compliance with submittal approvals, damage and storage information upon arrival at the job site and prior to incorporation into the work.
 - (7) Off site surveillance activities, including status of fabrication and production, control actions taken, and estimate of need date for next control actions.
 - (8) Job safety; safety hazards/violations, corrective action taken, safety meetings; daily comments required.

- b. The report must contain a record of control actions and tests for all work accomplished subsequent to the previous report. Separate reports of different phases of the work may be submitted by the responsible CQC representatives or they may be combined into one consolidated report.
- c. In all cases, the report or reports must be verified and signed by the designated Chief, Contractor Quality Control. The verification should contain the statement that all supplies and materials incorporated in the work are in compliance with the terms of the contract. These records shall cover both conforming and defective or deficient features. Legible copies of these records shall be maintained at the site and furnished to the Contracting Officer or his designated representative when so directed.

N. NAFI Quality Assurance: The Government's quality assurance activities will consist of construction project observation, review of CQC activities and records, and discussions of areas where contract deviations appear evident. Under no circumstances will the presence or absence of Government observation relieve the Contractor from full compliance with contract provisions.

H-27 NOT USED

H-28 KEY PERSONNEL

A. The personnel listed below or elsewhere in this contract are considered essential to the work being performed under this contract. Before removing, replacing, or diverting any of the listed or specified personnel, the Contractor must:

1. Notify the Contracting Officer reasonably in advance;
2. Submit justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact on this contract; and
3. Obtain the Contracting Officer's written approval. Notwithstanding the foregoing, if the Contractor deems immediate removal or suspension of any member of its management team is necessary to fulfill its obligation to maintain satisfactory standards of employee competency, conduct, and integrity, of the Contractor's Organization, the Contractor may remove or suspend such person at once, although the Contractor must notify Contracting Officer prior to or concurrently with such action.
4. All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor remove from the project any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

B. "Key Personnel" are identified in Section L of this solicitation and as proposed by the Offeror. This includes but is not limited to the following positions:

1. Project Manager
2. Chief of Contractor Quality Control
3. On-site Superintendent

4. Other individuals as listed by the Offeror in the proposal submitted to the NAFI.

C. The list of personnel may, with the consent of the Contracting Officer, be amended from time to time during the course of the contract to add or delete personnel.

H-29 PRODUCTS AND SUBSTITUTIONS

A. Pre-award:

1. Products in Section C-2 are generally specified by ASTM or other referenced standards and/or by manufacturer's name, model number, or trade name. The Offeror has the option of providing the listed product or submitting an equal substitute product.
2. A product proposed as an "equal" shall be such that all its salient characteristics conform to those of the listed brand name product. These salient characteristics may include, but are not limited to: design, function, size, quality, durability, color, style, texture, and other attributes which, given the nature of the project, may significantly affect its acceptability as a substitute for the listed product. The final determination as to whether a proposed substitute product is equal and/or acceptable will be made by the Contracting Officer.
3. Offeror's who propose to provide substitute products shall submit an itemized list of all proposed substitutions with their proposal. This list shall include the name of the listed product, the name and model of the proposed substitution, and the name and address of its manufacturer, and the quantity involved. With this list, provide the following for each proposed substitute item, as applicable:
 - a. Catalog cuts completely describing the product and its physical characteristics.
 - b. Performance and test data and specifications.
 - c. Color and/or pattern selections.
 - d. Recommended uses.
 - e. Installation recommendations.
 - f. Maintenance instructions.
4. If no proposed substitutions are included with the proposal, the Offeror shall provide the products listed in the RFP.

B. Post-award

1. Products listed by manufacturer's name, model number, or trade name generally are for design guidance criteria. The Contractor has the option of providing the listed product or submitting a request to the Contracting Officer for approval to substitute an equivalent product (see paragraph H-29, 1-1.C above for guidance on what data must be included in any such requests).
2. If a product is listed with the annotation "no substitution", the NAFI has determined that the particular product is the only one that will satisfy the project requirements, and no substitute product will be acceptable. The "no substitution" items in this RFP are: NONE

H-30 TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY (DD FORM 1354)

At the completion of the Project, but prior to final acceptance, prepare, under the direction of the Contracting Officer, an accounting of installed property on DD Form 1354 and other necessary information as required by UFC 1-300-08 and NAVFAC Guidance for the Preparation of DD Form 1354. Submit Interim DD Form 1354 42 calendar days prior to Beneficial Occupancy Date (BOD). Submit Final DD Form 1354 at contract closeout. DD Form 1354 (fillable) in ADOBE (PDF) may be obtained at the following web site: <http://www.dtic.mil/whs/directives/infomgt/forms/efoms/dd1354.pdf>

A draft DD Form 1354 will be included with the contract documents if required for the work covered by this contract.

END OF SECTION H

SECTION I

CONTRACT CLAUSES

(NONAPPROPRIATED FUND CONSTRUCTION, ALTERATION AND REPAIR CONTRACTS)

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- I-2 NONAPPROPRIATED FUND INSTRUMENTALITY**
- I-3 COVENANT AGAINST CONTINGENT FEES**
- I-4 CHANGES--CONSTRUCTION**
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- I-79 NOT USED**
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- I-81 NOT USED**
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- I-83 PRIVACY ACT NOTIFICATION**
- I-84 PRIVACY ACT**
- I-85 NOT USED**
- I-86 NOT USED**

I-1 DEFINITIONS

A. "Head of the agency" (also called "agency head") or "Secretary" means the Secretary of the Navy, the Under Secretary, and the term "authorized representative" means any person or board (other than the Contracting Officer) authorized to act for the head of agency or secretary.

B. "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts on behalf of the nonappropriated fund instrumentality that is a party to this contract and make related determinations and findings.

C. "Commercial Item" means a product or a service (e.g., items, supplies, materials, components) sold or traded to the general public in the course of conducting normal business operations at established catalog or market prices.

D. Except as otherwise provided in this contract, the term "subcontracts" includes, but is not limited to, purchase orders and changes and modifications to purchase orders under this contract.

I-2 NONAPPROPRIATED FUND INSTRUMENTALITY: The Non Appropriated Fund Instrumentality (NAFI) that is party to this contract is a nonappropriated fund instrumentality of the Department of the Navy. No appropriated funds of the United States shall become due or be paid the contractor by reason of this contract. This contract is NOT subject to the Contract Disputes Act of 1978. References to the United States, the Government and other related references will generally be implied to mean the NAFI throughout this contract.

I-3 COVENANT AGAINST CONTINGENT FEES: The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the contractor for the purpose of securing business. For breach or violation of this warranty the NAFI shall have the right to void this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

I-4 CHANGES -- CONSTRUCTION

A. The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the general scope of this contract including changes-

1. In the specifications (including drawings and designs);
2. In the method or manner of performance of the work;
3. In the NAFI-furnished property or services; or
4. Directing acceleration in the performance of the work.

B. Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer a timely written notice expressly stating (1) the date, circumstances, and source of the order and (2) a clear and unambiguous statement that the Contractor regards the order as a change order.

C. Except as provided in this clause, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the contractor to an equitable adjustment.

D. If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under paragraph (b) of this clause shall be made for any costs incurred more than 20 days before the Contractor gives written notice as required above. In the case of defective specifications for which the NAFI is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

E. The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting to the Contracting Officer a written statement describing the general nature and amount of proposal, unless this period is extended by the NAFI. The statement of proposal for adjustment may be included in the notice under paragraph (b) above.

F. No proposal by the contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

The preceding paragraphs do not apply to contracts for architect-engineer or other professional services. In all contracts for architect-engineer or other professional services, the following paragraphs apply:

G. The Contracting Officer may at any time, by written order, and without notice to the sureties, if any, make changes within the general scope of this contract in the services to be performed.

H. No services for which an additional cost or fee will be charged by the Contractor shall be furnished without the prior written authorization of the Contracting Officer.

I-5 NOT USED

I-6 SUBCONTRACTS FOR COMMERCIAL ITEMS AND COMMERCIAL COMPONENTS

A. Definitions. As used in this clause –

“Commercial item” has the meaning contained in the clause Definitions.

“Subcontract” includes a transfer of commercial items between divisions, subsidiaries, or affiliates of the contractor or subcontractor at any tier.

B. To the maximum extent practicable, the contractor shall incorporate, and require its subcontractors at all tiers to incorporate, commercial items as components of items to be supplied under this contract.

C. Notwithstanding any other clause of this contract, the contractor is not required to include any provision or clause, other than those listed below to the extent they are applicable and as may be required to establish the reasonableness of prices, in a subcontract at any tier for commercial items or commercial components.

1. Equal Opportunity (EO 11246);

2. Affirmative Action for Disabled Veterans and Veterans of the Vietnam Era (38 U.S.C. 4212(a)); and
3. Affirmative Action for Workers with Disabilities (29 U.S.C. 793).

D. The contractor shall include the terms of this clause, including this paragraph (d), in subcontractors awarded under this contract.

I-7 OFFICIALS NOT TO BENEFIT: No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit arising from it. However, this clause does not apply to this contract to the extent that this contract is made with a corporation for the corporation's general benefit.

I-8 GRATUITIES

A. The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative-

1. Offered or gave a gratuity (e.g., entertainment or gift) to an officer, official, or employee of the United States or the NAFI; and

2. Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

B. If this contract is terminated under paragraph (a) above, the NAFI is entitled to pursue the same remedies as in a breach of the contract.

C. The rights and remedies of the NAFI provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

I-9 MATERIAL AND WORKMANSHIP

A. All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, articles, or processes that, in the judgment of the Contracting Officer, are equal to that named in the specifications, unless otherwise specifically provided in this contract.

B. The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles that the Contractor contemplates incorporating in the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

C. All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor removes from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

I-10 COMPLIANCE WITH COPELAND ACT REQUIREMENTS: The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

I-11 EXAMINATION OF RECORDS

A. The Contractor agrees that the Contracting Officer or the Contracting Officer's duly authorized representative shall have the right to examine and audit the books and records of the Contractor directly pertaining to the contract during the period of the contract and until the expiration of three years after the final payment under the contract.

B. The Contractor agrees to include the clause in (a) above, in all subcontracts.

I-12 CONVICT LABOR

A. Except as provided in paragraph (b) of this clause, the contractor shall not employ in the performance of this contract any person undergoing a sentence of imprisonment imposed by any court of a State, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands.

B. The contractor is not prohibited from employing persons –

1. On parole or probation to work at paid employment during the term of their sentence;
2. Who have been pardoned or who have served their terms; or
3. Confined for violation of the laws of any of the States, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands who are authorized to work at paid employment in the community under the laws of such jurisdiction, if –
 - a. The worker is paid or is in an approved work-training program on a voluntary basis;
 - b. Representatives of local union central bodies or similar labor union organizations have been consulted;
 - c. Such paid employment will not result in the displacement of employed workers, or be applied in skills, crafts, or trades in which there is a surplus of available gainful labor in the locality, or impair existing contracts for services;
 - d. The rates of pay and other conditions of employment will not be less than those paid or provided for work of a similar nature in the locality in which the work is being performed; and
 - e. The Attorney General of the United States has certified that the work-release laws or regulations of the jurisdiction involved are in conformity with the requirements of Executive Order 11755, as amended by Executive Orders 12608 and 12943.

**I-13 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT—OVERTIME
COMPENSATION (Applicable to construction contracts of \$2,000 or more)**

A. Overtime requirements. No Contractor or subcontractor employing laborers or mechanics shall require or permit them to work over 40 hours in any work week unless they are paid at least 1 and 1/2 times the basic rate of pay for each hour worked over 40 hours.

B. Violation; liability for unpaid wages; liquidated damages. The responsible Contractor and subcontractor are liable for unpaid wages if they violate the terms in paragraph (a) of this clause. In addition, the Contractor and subcontractor are liable for liquidated damages payable to the NAFI. The Contracting Officer will assess liquidated damages at the rate of \$10 per affected employee for each calendar day on which the employer required or permitted the employee to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the Contract Work Hours and Safety Standards Act.

C. Withholding for unpaid wages and liquidated damages. The Contracting Officer will withhold from payments due under the contract sufficient funds required to satisfy any Contractor or subcontractor liabilities for unpaid wages and liquidated damages. If amounts withheld under the contract are insufficient to satisfy Contractor or subcontractor liabilities, the Contracting Officer will withhold payments from other NAF contracts held by the same Contractor that are subject to the Contract Work Hours and Safety Standards Act.

D. Payrolls and basic records.

1. The Contractor and its subcontractors shall maintain payrolls and basic payroll records for all laborers and mechanics working on the contract during the contract and shall make them available to the NAFI until 3 years after contract completion. The records shall contain the name and address of each employee, social security number, labor classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. The records need not duplicate those required for construction work by Department of Labor regulations at 29 CFR 5.5(a)(3) implementing the Davis-Bacon Act.

2. The Contractor and its subcontractors shall allow authorized representatives of the Contracting Officer or the Department of Labor to inspect, copy, or transcribe records maintained under paragraph "D.1" of this clause. The Contractor or subcontractor also shall allow authorized representatives of the Contracting Officer or Department of Labor to interview employees in the workplace during working hours.

E. Subcontracts. The Contractor shall insert the provisions set forth in paragraphs "A" through "D" of this clause in subcontracts exceeding \$100,000 and require subcontractors to include these provisions in any lower-tier subcontracts. The Contractor shall be responsible for compliance by any subcontractor or lower-tier subcontractor with the provisions set forth in paragraphs "A" through "D" of this clause.

I-14 EQUAL OPPORTUNITY

A. *Definition.* "United States," as used in this clause, means the 50 States, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, the U.S. Virgin Islands, and Wake Island.

B. 1. If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of \$10,000, the Contractor shall comply with this clause, except for work

performed outside the United States by employees who were not recruited within the United States. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.

2. If the Contractor is a religious corporation, association, educational institution, or society, the requirements of this clause do not apply with respect to the employment of individuals of a particular religion to perform work connected with the carrying on of the Contractor's activities (41 CFR 60-1.5).

C. 1. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. However, it shall not be a violation of this clause for the Contractor to extend a publicly announced preference in employment to Indians living on or near an Indian reservation, in connection with employment opportunities on or near an Indian reservation, as permitted by 41 CFR 60-1.5.

2. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to—

- a. Employment;
- b. Upgrading;
- c. Demotion;
- d. Transfer;
- e. Recruitment or recruitment advertising;
- f. Layoff or termination;
- g. Rates of pay or other forms of compensation; and
- h. Selection for training, including apprenticeship.

3. The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

4. The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

5. The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

6. The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

7. The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. The Contractor shall also file Standard Form 100 (EEO-1), or any successor form, as prescribed in 41 CFR Part 60-1. Unless the Contractor has filed within the 12 months preceding the date of contract award, the Contractor shall, within 30 days after contract award, apply to either the regional Office of Federal Contract Compliance Programs (OFCCP) or the local office of the Equal Employment Opportunity Commission for the necessary forms.

8. The Contractor shall permit access to its premises, during normal business hours, by the contracting agency or the OFCCP for the purpose of conducting on-site compliance evaluations and

complaint investigations. The Contractor shall permit the NAFI to inspect and copy any books, accounts, records (including computerized records), and other material that may be relevant to the matter under investigation and pertinent to compliance with Executive Order 11246, as amended, and rules and regulations that implement the Executive Order.

9. If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended; in the rules, regulations, and orders of the Secretary of Labor; or as otherwise provided by law.

10. The Contractor shall include the terms and conditions of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

11. The Contractor shall take such action with respect to any subcontract or purchase order as the Contracting Officer may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance, provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

D. Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

I-15 PROHIBITION OF SEGREGATED FACILITIES

A. "Segregated facilities", as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between sexes.

B. The contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in the contract.

C. The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

I-16 AFFIRMATIVE ACTION FOR WORKERS WITH DISABILITIES

A. General.

1. Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental disability. The Contractor agrees to take affirmative action to employ, advance in employment, and

otherwise treat qualified individuals with disabilities without discrimination based upon their physical or mental disability in all employment practices such as -

- a. Recruitment, advertising, and job application procedures;
- b. Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff, and rehiring;
- c. Rates of pay or any other form of compensation and changes in compensation;
- d. Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;
- e. Leaves of absence, sick leave, or any other leave;
- f. Fringe benefits available by virtue of employment, whether or not administered by the Contractor;
- g. Selection and financial support for training, including apprenticeships, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;
- h. Activities sponsored by the Contractor, including social or recreational programs; and;
- i. Any other term, condition, or privilege of employment.

2. The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.

B. Postings.

1. The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified individuals with disabilities and (ii) the rights of applicants and employees.

2. These notices shall be posted in conspicuous places that are available to employees and applicants for employment. The Contractor shall ensure that applicants and employees with disabilities are informed of the contents of the notice (e.g., the Contractor may have the notice read to a visually disabled individual, or may lower the posted notice so that it might be read by a person in a wheelchair). The notices shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance of the U.S. Department of Labor (Deputy Assistant Secretary) and shall be provided by or through the Contracting Officer.

3. The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Act and is committed to take affirmative action to employ, and advance in employment, qualified individuals with physical or mental disabilities.

C. Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

D. Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of \$10,000 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

I-17 BUY AMERICAN ACT-CONSTRUCTION MATERIALS

A. Definitions. As used in this clause -

"Component," means any article, material, or supply incorporated directly into construction materials.

"Construction material," means an article, material, or supply brought to the construction site by the Contractor or subcontractor for incorporation into the building or work. The term also includes an item brought to the site pre-assembled from articles, materials or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as a complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of such systems are delivered to the construction site. Materials purchased directly by the NAFI are supplies, not construction material.

"Cost of components" means – (1) For components purchased by the Contractor, the acquisition cost, including transportation costs to the place of incorporation into the end product (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or (2) For components manufactured by the Contractor, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the end product.

"Designated country" means any of the following countries: Aruba, Austria, Bangladesh, Belgium, Bhutan, Botswana, Burkina Faso, Burundi, Canada, Cape Verde, Central African Republic, Chad, Comoros, Denmark, Djibouti, Equatorial Guinea, Finland, France, Gambia, Germany, Greece, Guinea, Guinea-Bissau, Haiti, Hong Kong, Ireland, Israel, Italy, Japan, Kiribati, Korea, Republic of Lesotho, Liechtenstein, Luxembourg, Malawi, Maldives, Mail, Mozambique, Nepal, Netherlands, Niger, Norway, Portugal, Rwanda, Sao Tome and Principe, Sierra Leone, Singapore, Somalia, Spain, Sweden, Switzerland, Tanzania U.R., Togo, Tuvalu, Uganda, United Kingdom, Vanuatu, Western Samoa, Yemen.

"Designated country construction material" means a construction material that – (1) Is wholly the growth, product, or manufacture of a designated country; or (2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

"Domestic construction material," means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind for which non-availability determinations have been made are treated as domestic.

"Foreign construction material" means a construction material other than a domestic construction material.

"North American Free Trade Agreement Country" means Canada or Mexico.

"North American Free Trade Agreement Country Construction Material" means a construction material that (1) is wholly the growth, product, or manufacture of a North American Free Trade Agreement (NAFTA) country; or (2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

“United States” means the 50 states and the District of Columbia, U.S. Territories and possessions, Puerto Rico, the Northern Mariana Islands, and any other place subject to U.S. jurisdiction, but does not include leased bases.

B. Construction materials.

1. This clause implements the Buy American Act (41 U.S.C. 10a-10d) and the Balance of Payments Program by providing a preference for domestic construction material. In addition, the Contracting Officer has determined that the Trade Agreements Act and the North American Free Trade Agreement (NAFTA) apply to this acquisition. Therefore, the Buy American Act and Balance of Payments Program restrictions are waived for designated country and NAFTA country construction materials.

2. The Contractor shall use only domestic, designated country, or NAFTA country construction material in performing this contract, except as provided in paragraphs “B.3 and B.4” of this clause.

3. The requirement in paragraph “B.2” of this clause does not apply to the construction materials or components listed by the NAFI as follows: None

4. The Contracting Officer may add other foreign construction material to the list in paragraph “B.3” of this clause if the NAFI determines that –

- a. The cost of domestic construction material would be unreasonable. The cost of a particular domestic construction material subject to the restrictions of the Buy American Act is unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent. For determination of unreasonable cost under the Balance of Payments Program, the Contracting Officer will use a factor of 50 percent;
- b. The application of the restriction of the Buy American Act or Balance of Payments Program to a particular construction material would be impracticable or inconsistent with the public interest; or
- c. The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

C. Request for determination of inapplicability of the Buy American Act or Balance of Payments Program.

1. a. Any Contractor request to use foreign construction material in accordance with paragraph “B.4” of this clause shall include adequate information for NAFI evaluation of the request, including –
 - (1) A description of the foreign and domestic construction materials
 - (2) Unit of measure
 - (3) Quantity
 - (4) Price
 - (5) Time of delivery or availability
 - (6) Location of the construction project
 - (7) Name and address of the proposed supplier; and
 - (8) A detailed justification of the reason for use of foreign construction materials cited in accordance with paragraph “B.3” of this clause.
- b. A request based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph “D” of this clause.

- c. The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).
- d. Any contractor request for a determination submitted after contract award shall explain why the contractor could not reasonable foresee the need for such determination and could not have requested the determination before contract award. If the contractor does not submit a satisfactory explanation, the contracting officer need not make a determination.

2. If the NAFI determines after contract award that an exception to the Buy American Act or Balance of Payments Program applies and the Contracting Officer and the contractor negotiate adequate consideration, the contracting officer will modify the contract to allow use of the foreign construction material. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration is not less than the differential established in paragraph "B.4.a" of this clause.

3. Unless the NAFI determines that an exception of the Buy American Act or the Balance of Payments Program applies, use of foreign construction material is noncompliant with the Buy American Act or Balance of Payments Program.

D. Data. To permit evaluation of requests under paragraph "C" of this clause based on unreasonable cost, the contractor shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Construction Materials Price Comparison

Construction Material Description	Unit of Measure	Quantity	Price
Item 1			
Foreign construction material			
Domestic construction material			
Item 2			
Foreign construction material			
Domestic construction material			

*Include all delivery costs to the construction site and applicable duty (whether or not a duty-free entry certificate is issued). List name, address, telephone number, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary. Include other applicable supporting information.

I-18 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES

A. The Contractor shall not acquire, for use in the performance of this contract, any supplies or services originating from sources within, or that were located in or transported from or through countries whose products are banned from importation into the United States under regulations of the Office of Foreign Assets Control, Department of Treasury. Those countries include Cuba, Iran, Iraq, Libya and North Korea, Sudan, the territory of Afghanistan controlled by the Taliban, and Serbia (excluding the territory of Kosovo).

B. The Contractor shall not acquire for use in the performance of this contract any supplies or services from entities controlled by the Government of Iraq.

C. The Contractor shall insert this clause, including this paragraph (c), in all subcontracts hereunder.

I-19 INSURANCE WORK ON A GOVERNMENT INSTALLATION

A. The Contractor shall, at its own expense, provide and maintain during the entire performance period of this contract, at least the kinds and minimum amounts of insurance required in the Schedule or elsewhere in the contract. In no event shall the amount be lesser than the minimum requirements established by applicable state and local regulations and laws.

B. Before commencing work under this contract, the Contractor shall certify to the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the NAFI's interest shall not be effective (1) for such period as the laws of the State in which the contract is to be performed prescribed at (2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

C. The Contractor shall insert the substance of this clause, including this paragraph "C", in subcontracts under this contract that require work on a Government installation or Government-controlled property and shall require subcontractors to provide and maintain the insurance required in this Schedule or elsewhere in the contract. The contractor shall maintain a copy of all subcontractors' proof of required insurance, and shall make copies available to the Contracting Officer upon request.

I-20 TAXES

A. Except as may be otherwise provided in this contract, the contract price includes all taxes, duties, or other public charges in effect and applicable to this contract on the contract date, except any tax, duty or other public charge which by law, regulation or governmental agreement is not applicable to expenditures made by the NAFI or on its behalf: or any tax, duty, or other public charge from which the Contractor, or any subcontractor hereunder, is exempt by law, regulation or otherwise. If any such tax, duty, or other public charge has been included in the contract price, through error or otherwise, the contract price shall be correspondingly reduced. Mississippi charges a 3.5% bottom line tax on construction work. One can get sales tax exemption on materials, but must pay 3.5% tax.

B. If for any reason, after the contract date of execution, the Contractor or subcontractor is relived in whole or in part from the payment or the burden of any tax, duty or other public charge included in the contract price, the contract price shall be correspondingly reduced; or if the Contractor or a subcontractor is required to pay in whole or in part any tax, duty, or other public charge which was not included in the contract price and which was not applicable at the contract date of execution the contract price shall be correspondingly increased.

C. No adjustment of less than \$500 shall be made in the contract price pursuant to this clause.

D. With respect to foreign taxes, NAFI's located in foreign countries will not pay to nor collect for any foreign country or political subdivision any tax unless the United States has consented to levy collection by treaty, convention, or executive agreement.

I-21 EXTRAS

Except as otherwise provided in this contract, no payment for extras shall be made unless the Contracting Officer has authorized such extras and the price is in writing.

I-22 PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS

A. Notwithstanding any other payment terms in this contract, the NAFI will make invoice payments and contract financing payments under the terms and conditions specified in this clause. Payment shall be considered as being made on the day a check is dated or the date of an electronic funds transfer. All days referred to in this clause are calendar days, unless otherwise specified. (However, see paragraph “A.3” concerning payments due on Saturdays, Sundays, and legal holidays).

1. Invoice Payments. – Types of invoice payments. For purposes of this clause, there are several types of invoice payments, which may occur under this contract, as follows:

a. Progress payments, if provided for elsewhere in this contract and not more frequently than monthly, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project:

- (1) The due date for making such payments shall be 14 days after receipt of the payment request by the designated billing office. If the designated billing office fails to annotate the payment request with the actual date of receipt at the time of receipt, the payment due date shall be the 14th day after the date the Contractor's payment request, provided a proper payment request is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.
- (2) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause entitled, Payments Under Fixed-Price Construction Contracts, shall be as specified in the contract or, if not specified, 30 days after approval for release to the Contractor by the Contracting Officer.

b. Final payments based on completion and acceptance of all work and presentation of release of all claims against the NAFI arising by virtue of the contract, and payments for partial deliveries that have been accepted by the NAFI (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract):

- (1) The due date for making such payments shall be either the 30th day after receipt by the designated billing office of a proper invoice from the Contractor, or the 30th day after NAFI acceptance of the work or services completed by the Contractor, whichever is later. If the designated billing office fails to annotate the invoice with the date of actual receipt, the invoice payment due date shall be deemed to be the 30th day after the date the Contractor's invoice, provided a proper invoice is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.
- (2) On a final invoice where the payment amount is subject to contract settlement actions (e.g., release of claims), acceptance shall be deemed to have occurred on the effective date of the contract settlement.

2. Contractor's invoice. The contractor shall prepare and submit invoices to the designated billing office specified in the contract. A proper invoice must include the items listed in subdivisions “A.2.a” through “A.2.i” of this clause. If the invoice does not comply with these requirements, it shall be returned within 7 days after the date the designated billing office received the invoice, with a statement of the reasons why it is not a proper invoice. Untimely notification will be taken into account in computing any interest penalty owed the contractor in the manner described in subparagraph “A.4” of this clause.

a. Name and address of the Contractor.

- b. Invoice date and identification number. (The contractor is encouraged to date invoices as close as possible to the date of mailing or transmission and to assign an identification number to each invoice).
- c. Contract number or other authorization for work or services performed (including order number and contract line item number).
- d. Description of work or services performed.
- e. Delivery and payment terms (e.g., prompt payment discount terms).
- f. Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).
- g. Name (where practicable), title, phone number, and mailing address of person to be notified in event of a defective invoice.
- h. For payments described in subdivision "A.1.a" of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause entitled Payments Under Fixed-Price Construction Contracts.
- i. Any other information or documentation required by the contract.

3. Interest penalty. An interest penalty shall be paid automatically by the designated payment office, without request from the Contractor, if payment is not made by the due date and the conditions listed in subdivisions "A.3.a" through "A.3.c" of this clause are met, if applicable. However, when the due date falls on a Saturday, Sunday, or legal holiday when Federal Government offices are closed and NAFI business is not expected to be conducted, payment may be made on the following business day without incurring a late payment interest penalty.

- a. The designated billing office received a proper invoice.
- b. A receiving report or other NAFI documentation authorizing payment was processed and there was no disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.
- c. In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the NAFI and the Contractor.

4. Computing penalty amount. The interest penalty shall be at the rate established by the Secretary of the Treasury under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611, however other provisions of the Act are not applicable to NAFIs - see Disputes Clause) that is in effect on the day after the due date, except where the interest penalty is prescribed by other governmental authority (e.g., tariffs). This rate is referred to as the "Renegotiation Board Interest Rate," and it is published in the Federal Register semiannually on or about January 1 and July 1. The interest penalty shall accrue daily on the invoice principle payment amount approved by the NAFI until the payment date of such approved principal amount; and will be compounded in 30-day increments inclusive from the first day after the due date through the payment date. That is, interest accrued at the end of any 30-day period will be added to the approved invoice principle payment amount and be subject to interest penalties if not paid in the succeeding 30-day period. If the designated billing office failed to notify the Contractor of a defective invoice within the periods prescribed in subparagraph "A.2" of this clause, the due date on the corrected invoice will be adjusted by subtracting from such date the number of days taken beyond the prescribed notification of defects period. Any interest penalty owed the Contractor will be based on this adjusted due date. Adjustments will be made by the designated payment office for errors in calculating interest penalties.

- a. For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in subdivision "A.1.b" of this clause, NAFI acceptance or approval shall be deemed to have occurred constructively on the 7th day after the Contractor has completed

the work or services in accordance with the terms and conditions of the contract. In the event that actual acceptance or approval occurs within the constructive acceptance or approval period, the determination of an interest penalty shall be based on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. These requirements also do not compel NAFI officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

b. The following periods of time will not be included in the determination of an interest penalty:

- (1) The period taken to notify the Contractor of defects in invoices submitted to the NAFI, but this may not exceed 7 days.
- (2) The period between the defects notice and resubmission of the corrected invoice by the Contractor.
- (3) For incorrect electronic funds transfer (EFT) information, in accordance with the EFT clause of this contract.

c. Interest penalties will not continue to accrue after the filing of a claim for such penalties under the clause entitled, Disputes, or for more than 1 year. Interest penalties of less than \$1.00 need not be paid.

(1). Interest penalties are not required on payment delays due to disagreement between the NAFI and the Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. Claims involving disputes, and any interest that may be payable, will be resolved in accordance with the clause entitled, Disputes.

5. Prompt payment discounts. An interest penalty shall also be paid automatically by the designated payment office, without request from the Contractor, if a discount for prompt payment is taken improperly. The interest penalty will be calculated on the amount of discount taken for the period beginning with the first day after the end of the discount period through the date when the Contractor is paid.

6. Additional interest penalty.

a. A penalty amount, calculated in accordance with subdivision "A.6.c" of this clause, shall be paid in addition to the interest penalty amount if the Contractor—

- (1) Is owed an interest penalty of \$1 or more;
- (2) Is not paid the interest penalty within 10 days after the date the invoice amount is paid; and
- (3) Makes a written demand to the designated payment office for additional penalty payment, in accordance with subdivision "A.4.b" of this clause, postmarked not later than 40 days after the date the invoice amount is paid.

b. (1) Contractors shall support written demands for additional penalty payments with the following data. No additional data shall be required. Contractors shall—

- (a) Specifically assert that late payment interest is due under a specific invoice, and request payment of all overdue late payment interest penalty and such additional penalty as may be required;
 - (b) Attach a copy of the invoice on which the unpaid late payment interest was due; and
 - (c) State that payment of the principal has been received, including the date of receipt.
- (2) Demands must be postmarked on or before the 40th day after payment was made, except that--
 - (a) If the postmark is illegible or nonexistent, the demand must have been received and annotated with the date of receipt by the designated payment office on or before the 40th day after payment was made; or
 - (b) If the postmark is illegible or nonexistent and the designated payment office fails to make the required annotation, the demand's validity will be determined by the date the Contractor has placed on the demand; provided such date is no later than the 40th day after payment was made.
- c. (1) The additional penalty shall be equal to 100 percent of any original late payment interest penalty except—
 - (a) The additional penalty shall not exceed \$5,000;
 - (b) The additional penalty shall never be less than \$25; and
 - (c) No additional penalty is owed if the amount of the underlying interest penalty is less than \$1.
- (2) If the interest penalty ceases to accrue in accordance with the limits stated in subdivision “A.4.c” of this clause, the amount of the additional penalty shall be calculated on the amount of interest penalty that would have accrued in the absence of these limits, subject to the overall limits on the additional penalty specified in subdivision “A.6.c.(1)” of this clause.
- (3) For determining the maximum and minimum additional penalties, the test shall be the interest penalty due on each separate payment made for each separate contract. The maximum and minimum additional penalty shall not be based upon individual invoices unless the invoices are paid separately. Where payments are consolidated for disbursing purposes, the maximum and minimum additional penalty determination shall be made separately for each contract therein.
- (4) The additional penalty does not apply to payments regulated by other Government regulations (e.g., payments under utility contracts subject to tariffs and regulation).

B. Contract financing payments—

1. Due dates for recurring financing payments. If this contract provides for contract financing, requests for payment shall be submitted to the designated billing office as specified in this contract or as directed by the Contracting Officer. Contract financing payments shall be made on the [insert day as prescribed by Agency head; if not prescribed, insert 30th day] day after receipt of a proper contract-financing request by the designated billing office. In the event that an audit or other review of a specific financing request is required to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the due date specified.

2. Due dates for other contract financing. For advance payments, loans, or other arrangements that do not involve recurring submissions of contract financing requests, payment shall be made in accordance with the corresponding contract terms or as directed by the Contracting Officer.

3. Interest penalty not applicable. Contract financing payments shall not be assessed an interest penalty for payment delays.

C. Subcontract clause requirements. The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:

1. Prompt payment for subcontractors. A payment clause that obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.

2. Interest for subcontractors. An interest penalty clause that obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause—

- a. For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and
- b. Computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) (otherwise CDA does not apply to this contract) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

3. Subcontractor clause flowdown. A clause requiring each subcontractor to include a payment clause and an interest penalty clause conforming to the standards set forth in subparagraphs “C.1” and “C.2” of this clause in each of its subcontracts, and to require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.

D. Subcontract clause interpretation. The clauses required by paragraph “C” of this clause shall not be construed to impair the right of the Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions that—

1. Retainage permitted. Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the subcontract, giving such recognition as the parties deem appropriate to the ability of a subcontractor to furnish a performance bond and a payment bond;

2. Withholding permitted. Permit the Contractor or subcontractor to make a determination that part or all of the subcontractor's request for payment may be withheld in accordance with the subcontract agreement; and

3. Withholding requirements. Permit such withholding without incurring any obligation to pay a late payment penalty if--

- a. A notice conforming to the standards of paragraph “G” of this clause previously has been furnished to the subcontractor; and
- b. A copy of any notice issued by a Contractor pursuant to subdivision “D.3.a” of this clause has been furnished to the Contracting Officer.

E. Subcontractor withholding procedures. If a Contractor, after making a request for payment to the NAFI but before making a payment to a subcontractor for the subcontractor's performance covered by the payment request, discovers that all or a portion of the payment otherwise due such subcontractor is subject to withholding from the subcontractor in accordance with the subcontract agreement, then the Contractor shall—

1. Subcontractor notice. Furnish to the subcontractor a notice conforming to the standards of paragraph “G” of this clause as soon as practicable upon ascertaining the cause giving rise to a withholding, but prior to the due date for subcontractor payment;

2. Contracting Officer notice. Furnish to the Contracting Officer, as soon as practicable, a copy of the notice furnished to the subcontractor pursuant to subparagraph “E.1” of this clause;

3. Subcontractor progress payment reduction. Reduce the subcontractor's progress payment by an amount not to exceed the amount specified in the notice of withholding furnished under subparagraph “E.1” of this clause;

4. Subsequent subcontractor payment. Pay the subcontractor as soon as practicable after the correction of the identified subcontract performance deficiency, and—

a. Make such payment within—

(1) Seven days after correction of the identified subcontract performance deficiency (unless the funds therefore must be recovered from the NAFI because of a reduction under subdivision “E.5.a” of this clause; or

(2) Seven days after the Contractor recovers such funds from the NAFI; or

b. Incur an obligation to pay a late payment interest penalty computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611)(otherwise the CDA of 1978 does not apply to this contract) in effect at the time the Contractor accrues the obligation to pay an interest penalty;

5. Notice to Contracting Officer. Notify the Contracting Officer upon—

a. Reduction of the amount of any subsequent certified application for payment; or

b. Payment to the subcontractor of any withheld amounts of a progress payment, specifying—

(1) The amounts withheld under subparagraph “E.1” of this clause; and

(2) The dates that such withholding began and ended; and

6. Interest to NAFI. Be obligated to pay to the NAFI an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the NAFI until—

a. The day the identified subcontractor performance deficiency is corrected; or

b. The date that any subsequent payment is reduced under subdivision “E.5.a” of this clause.

F. Third-party deficiency reports—

1. Withholding from subcontractor. If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a "second-tier subcontractor") a written notice in accordance with section 2 of the Act of August 24, 1935 (40 U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, the Contractor may, without incurring an obligation to pay an interest penalty under subparagraph "E.6" of this clause—

- a. Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph "G" of this clause as soon as practicable upon making such determination; and
- b. Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under subdivision "F.1.a" of this clause.

2. Subsequent payment or interest charge. As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall—

- a. Pay the amount withheld under subdivision "F.1.b" of this clause to such first-tier subcontractor; or
- b. Incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611)(otherwise CDA of 1978 does not apply to this contract) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

G. Written notice of subcontractor withholding. A written notice of any withholding shall be issued to a subcontractor (with a copy to the Contracting Officer of any such notice issued by the Contractor), specifying—

1. The amount to be withheld;
2. The specific causes for the withholding under the terms of the subcontract; and
3. The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.

H. Subcontractor payment entitlement. The Contractor may not request payment from the NAFI of any amount withheld or retained in accordance with paragraph "D" of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.

I. Prime-subcontractor disputes. A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph "C" of this clause does not constitute a dispute to which the NAFI is a party. The NAFI may not be interpleaded in any judicial or administrative proceeding involving such a dispute.

J. Preservation of prime-subcontractor rights. Except as provided in paragraph "I" of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to

the Contractor or a subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.

K. Non-recourse for prime contractor interest penalty. The Contractor's obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph "C" of this clause shall not be construed to be an obligation of the NAFI for such interest penalty. A cost-reimbursement claim may not include any amount for reimbursement of such interest penalty.

I-23 AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION

A. Definitions. As used in this clause—

1. "Covered area," as used in this clause, means the geographical area described in the solicitation for this contract.

2. "Deputy Assistant Secretary," as used in this clause, means the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, or a designee.

3. "Employer's identification number," as used in this clause, means the Federal Social Security number used on the employer's quarterly federal tax return, U.S. Treasury Department Form 941.

4. "Minority," as used in this clause, means—

- a. American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
- b. Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);
- c. Black (all persons having origins in any of the black African racial groups not of Hispanic origin); and
- d. Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race).

B. If the Contractor, or a subcontractor at any tier, subcontracts a portion of the work involving any construction trade, each such subcontract in excess of \$10,000 shall include this clause and the Notice containing the goals for minority and female participation stated in the solicitation for this contract.

C. If the Contractor is participating in a Hometown Plan (41 CFR 60-4) approved by the U.S. Department of Labor in a covered area, either individually or through an association, its affirmative action obligations on all work in the plan area (including goals) shall comply with the plan for those trades that have unions participating in the plan. Contractors must be able to demonstrate participation in, and compliance with, the provisions of the plan. Each Contractor or subcontractor participating in an approved plan is also required to comply with its obligations under the Equal Opportunity clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good-faith performance by other Contractors or subcontractors toward a goal in an approved plan does not excuse any Contractor's or subcontractor's failure to make good-faith efforts to achieve the plan's goals.

D. The Contractor shall implement the affirmative action procedures in subparagraphs "G.1 – 16" of this clause. The goals stated in the solicitation for this contract are expressed as percentages of the total hours of employment and training of minority and female utilization that the Contractor should reasonably be

able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where that work is actually performed. The Contractor is expected to make substantially uniform progress toward its goals in each craft.

E. Neither the terms and conditions of any collective bargaining agreement, nor the failure by a union with which the Contractor has a collective bargaining agreement, to refer minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, as amended, or the regulations thereunder.

F. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainee at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

G. The Contractor shall take affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:

1. Ensure a working environment free of harassment, intimidation, and coercion at all sites and in all facilities where the Contractor's employees are assigned to work. The Contractor, if possible, will assign two or more women to each construction project. The Contractor shall ensure that foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at these sites or facilities.

2. Establish and maintain a current list of sources for minority and female recruitment. Provide written notification to minority and female recruitment sources and community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

3. Establish and maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant, referrals of minorities or females from unions, recruitment sources, or community organizations, and the action taken with respect to each individual. If an individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred back, not employed by the Contractor, this shall be documented in the file, along with whatever additional actions the Contractor may have taken.

4. Immediately notify the Deputy Assistant Secretary when the union or unions with which the Contractor has a collective bargaining agreement has not referred back to the Contractor a minority or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

5. Develop on-the-job training opportunities and/or participate in training programs for the area that expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under subparagraph "G.2" above.

6. Disseminate the Contractor's equal employment policy by—

- a. Providing notice of the policy to unions and to training, recruitment, and outreach programs, and requesting their cooperation in assisting the Contractor in meeting its contract obligations;
- b. Including the policy in any policy manual and in collective bargaining agreements;
- c. Publicizing the policy in the company newspaper, annual report, etc;
- d. Reviewing the policy with all management personnel and with all minority and female employees at least once a year; and
- e. Posting the policy on bulletin boards accessible to employees at each location where construction work is performed.

7. Review, at least annually, the Contractor's equal employment policy and affirmative action obligations with all employees having responsibility for hiring, assignment, layoff, termination, or other employment decisions. Conduct review of this policy with all onsite supervisory personnel before initiating construction work at a job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

8. Disseminate the Contractor's equal employment policy externally by including it in any advertising in the news media, specifically including minority and female news media. Provide written notification to, and discuss this policy with, other Contractors and subcontractors with which the Contractor does or anticipates doing business.

9. Direct recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than 1 month before the date for acceptance of applications for apprenticeship or training by any recruitment source, send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

10. Encourage present minority and female employees to recruit minority persons and women. Where reasonable, provide after-school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's workforce.

11. Validate all tests and other selection requirements where required.

12. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities. Encourage these employees to seek or to prepare for, through appropriate training, etc., opportunities for promotion.

13. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the Contractor's obligations under this contract are being carried out.

14. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

15. Maintain a record of solicitations for subcontracts for minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

16. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's equal employment policy and affirmative action obligations.

H. The Contractor is encouraged to participate in voluntary associations that may assist in fulfilling one or more of the affirmative action obligations contained in subparagraphs "G.1 – G.16". The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant may be asserted as fulfilling one or more of its obligations under subparagraphs "G.1 – G.16", provided the Contractor—

1. Actively participates in the group;
2. Makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry;
3. Ensures that concrete benefits of the program are reflected in the Contractor's minority and female workforce participation;
4. Makes a good-faith effort to meet its individual goals and timetables; and
5. Can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply is the Contractor's, and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

I. A single goal for minorities and a separate single goal for women shall be established. The Contractor is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of Executive Order 11246, as amended, if a particular group is employed in a substantially disparate manner.

J. The Contractor shall not use goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

K. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts under Executive Order 11246, as amended.

L. The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal Opportunity clause, including suspension, termination, and cancellation of existing subcontracts, as may be imposed or ordered under Executive Order 11246, as amended, and its implementing regulations, by the OFCCP. Any failure to carry out these sanctions and penalties as ordered shall be a violation of this clause and Executive Order 11246, as amended.

M. The Contractor in fulfilling its obligations under this clause shall implement affirmative action procedures at least as extensive as those prescribed in paragraph (g) of this clause, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or this clause, the Deputy Assistant Secretary shall take action as prescribed in 41 CFR 60-4.8.

N. The Contractor shall designate a responsible official to—

1. Monitor all employment-related activity to ensure that the Contractor's equal employment policy is being carried out;

2. Submit reports as may be required by the Government/NAFI; and

3. Keep records that shall at least include for each employee the name, address, telephone number, construction trade, union affiliation (if any), employee identification number, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, separate records are not required to be maintained.

O. Nothing contained herein shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

I-24 ASSIGNMENT OF CLAIMS: The contractor cannot assign any right or delegate any obligations under this contract without the prior written permission of the Contracting Officer.

I-25 NONWAIVER OF DEFAULTS: Any failure by the NAFI at any time, or from time to time, to enforce or require strict performance of any terms or conditions of this contract will not constitute waiver thereof and will not affect or impair such terms or conditions in any way or the NAFI's right at any time to avail itself of such remedies as it may have for any breach or breaches of such terms and conditions.

I-26 DISPUTES

A. This contract is subject to the rules and regulations promulgated by the Secretary of Defense and Secretary of the Navy for NAF contracting.

B. The contract is not subject to the Contract Disputes Act of 1978 (41 U.S.C. 60I-613).

C. All disputes arising under or relating to this contract shall be resolved under this clause.

D. "Claims," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract forms, or other relief arising under or relating to this contract. A claim arising under a contract, unlike a claim relating to that contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under this clause. The submission may be converted to a claim under this clause, by complying with the submission requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

E. 1. A claim by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the NAFI against the Contractor shall be subject to a written decision by the Contracting Officer.

2. For Contractor claims exceeding \$100,000, the Contractor shall submit with the claim a certification that-

- a. The claim is made in good faith;
- b. Supporting data are accurate and complete to the best of the Contractor's knowledge and belief; and

- c. The amount requested accurately reflects the contract adjustment for which the contractor believes the NAFI is liable.
- 3. a. If the Contractor is an individual, the certification shall be executed by that individual.
b. If the Contractor is not an individual, the certification shall be executed by-
 - (1) A senior company official in charge at the Contractor's plant or location involved, or
 - (2) An officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.

F. For contract claims of \$100,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over \$100,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.

G. The Contracting Officer's decision shall be final unless the contractor appeals as provided in paragraph "H" of this clause.

H. The Contracting Officer's final decision on claims may be appealed by submitting a written appeal to Commander, Navy Installations Command (CNIC), within 90 days of receipt of the Contracting Officer's final decision. Decisions of the Commander, Navy Installations Command are final and are not subject to further appeal.

I. The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under the contract, and comply with any decision of the Contracting Officer.

I-27 PROPERTY RECORDS: The NAFI shall maintain the NAFI's official property records in connection with NAFI property under this contract. Deleting the requirement for the contractor to maintain such records hereby modifies the clause NAFI Property.

I-28 NAFI PROPERTY

A. The Contractor shall sign a receipt for any property furnished by the NAFI and upon expiration of this contract shall return such property to the NAFI in the same condition as when received, except for fair wear and tear.

B. Such property will be supplied to the Contractor in a condition suitable for the intended use and in a timely manner.

C. If property is received in a less than functional state or in a time frame which would delay Contractor's performance, the Contractor shall, upon receipt of property, notify the Contracting Officer, detailing the facts, and as directed by the Contracting Officer and at NAFI expense, either repair, modify, return or otherwise dispose of the property. In the case of an untimely delivery by the NAFI, the Contracting Officer shall make a determination of the delay, if any, caused by the NAFI, and the Contracting Officer shall make an equitable adjustment in accordance with paragraph "D".

D. The Contracting Officer shall, upon written notification from the Contractor of any such discrepancies, make an equitable adjustment from such expenses incurred by the contractor.

E. After completion of the contract, if any such property is lost, damaged or destroyed by the Contractor, the NAFI shall be paid the cost of repairs of damages or the fair market value of the property as determined by the Contracting Officer.

F. Equitable adjustment. When this clause specifies an equitable adjustment, it shall be made to any affected contract provision in accordance with the procedures of the Changes clause. When appropriate, the Contracting Officer may initiate an equitable adjustment in favor of the NAFI. The right to any equitable adjustment shall be the Contractor's exclusive remedy. The NAFI shall not be liable for breach of contract for--

1. Any delay in delivery of NAFI furnished property;
2. Delivery of NAFI furnished property in a condition not suitable for its intended use,
3. A decrease in or substitution of NAFI furnished property; or
4. Failure to repair or replace NAFI property for which the NAFI is responsible.

I-29 COMMERCIAL WARRANTY: The contractor agrees that the supplies or services furnished under this contract shall be covered by the most favorable commercial warranties the contractor gives to any customer for such supplies or services and that the rights and remedies provided herein are in addition to and to not limit any rights afforded to the NAFI by any other clause of this contract.

I-30 PROTECTING THE NAFI'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED OR PROPOSED FOR DEBARMENT

A. The Government suspends or debar Contractors to protect the Government/NAFI's interests. The Contractor shall not enter into any subcontract in excess of \$25,000 with a Contractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

B. The Contractor shall require each proposed first-tier subcontractor, whose subcontract will exceed \$25,000, to disclose to the Contractor, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principals, is or is not debarred, suspended, or proposed for debarment by the Federal Government.

C. A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is debarred, suspended, or proposed for debarment (see <https://www.epls.gov> for information on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs). The notice must include the following:

1. The name of the subcontractor.
2. The Contractor's knowledge of the reasons for the subcontractor being on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.
3. The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.
4. The systems and procedures the Contractor has established to ensure that it is fully protecting the NAFI's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

I-31 CLAUSES INCORPORATED BY REFERENCE: This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Full text is available upon request.

I-32 TERMINATION FOR CONVENIENCE: The Contracting Officer, by written notice, may terminate this contract, in whole or in part, when it is in the best interest of the NAFI in accordance with BUPERINST 7043.1B. In the event of such termination, the contractor shall immediately stop all terminated work hereunder and shall immediately cause any and all of its suppliers and subcontractors to cease work on the terminated portion(s) of the contract. Subject to the terms of this contract, the contractor shall be paid a percentage of the contract price reflecting the percentage of the work performed prior to the notice of termination, plus reasonable charges that the contractor can demonstrate to the satisfaction of the NAFI, using its standard record keeping system, have resulted from the termination. The contractor shall not be paid for any work performed or costs incurred that reasonably could have been avoided.

I-33 DEFAULT (FIXED-PRICE CONSTRUCTION)

A. If the Contractor refuses or fails to prosecute the work, or any separable part, with the diligence that will ensure its completion within the time specified in this contract including any extension, or fails to complete the work within this time, the NAFI may, by written notice to the Contractor, terminate the right to proceed with the work or the separable part of the work that has been delayed. In this event, the NAFI may take over the work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the NAFI resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the NAFI in completing the work.

B. The Contractor's right to proceed shall not be terminated nor the Contractor charged with damages under this clause, if:

1. The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God or of the public enemy, (ii) acts of the NAFI and /or Government, in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with the NAFI or with the government, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and such subcontractors or suppliers; and

2. The Contractor, within 10 days from the beginning of any delay (unless extended by the Contracting Officer), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, the time for completing the work shall be extended. The findings of the Contracting Officer shall be final and conclusive on the parties, but subject to appeal under the Disputes clause.

C. If, after termination of the contractor's right to proceed, it is determined that the contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination has been issued for convenience of the NAFI.

D. The rights and remedies of the NAFI in this clause are in addition to any other rights and remedies provided by law or under this contract.

I-34 WARRANTY OF CONSTRUCTION

A. In addition to any other warranties in this contract, the contractor warrants, except as provided in paragraph "J" of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

B. This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the NAFI takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the NAFI takes possession.

C. The Contractor shall remedy at the Contractor's expense any damage to NAFI or Government owned or controlled real or personal property, when that damage is the result of--

1. The Contractor's failure to conform to contract requirements; or
2. Any defect of equipment, material, workmanship, or design furnished.

D. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

E. The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.

F. If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the NAFI shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

G. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall—

1. Obtain all warranties that would be given in normal commercial practice;
2. Require all warranties to be executed, in writing, for the benefit of the NAFI if directed by the Contracting Officer; and
3. Enforce all warranties for the benefit of the NAFI, if directed by the Contracting Officer.

H. In the event the Contractor's warranty under paragraph (b) of this clause has expired, the NAFI may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

I. Unless a defect is caused by the negligence of the contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the NAFI nor for the repair of any damage that results from any defects, gross mistakes, or fraud.

J. This warranty shall not limit the NAFI's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

I-35 ACCIDENT PREVENTION, FIRE PROTECTION, AND SANITATION: If this contract is performed in whole or in part on premises owned or under the control of the United States Government and/or the NAFI, the Contractor shall conform to all safety regulations and requirements concerning such premises in effect any time during the performance of the contract and take all necessary steps and precautions to prevent accidents.

I-36 MODIFICATION PROPOSALS-PRICE BREAKDOWN: The Contractor, in connection with any proposal he makes for a contract modification, shall furnish a price breakdown, itemized as required by the Contracting Officer. Unless otherwise directed, the breakdown shall be in sufficient detail to permit any analysis of all material, labor, equipment, subcontract and overhead costs, as well as profit, and shall cover all work involved in the modification, whether such work was deleted, added or changed. Any amount claimed for subcontracts shall be supported by a similar price breakdown. In addition, if the proposal includes a time extension, the justification therefore shall also be furnished. The proposal, together with the price breakdown and time extension justification, shall be furnished by the date specified by the Contracting Officer.

I-37 PAYMENT BY THIRD PARTY

A. General. The Contractor agrees to accept payments due under this contract, through payment by a third party in lieu of payment directly from the NAFI, in accordance with the terms of this clause. The third party and, if applicable, the particular Government-wide commercial credit card to be used are identified elsewhere in this contract.

B. Contractor payment request. In accordance with the clauses of this contract that authorize the Contractor to submit invoices, contract financing requests, or as provided in other clauses providing for payment to the Contractor, the Contractor shall make such payment requests through a charge to the NAFI account with the third party, at the time and for the amount due in accordance with the terms of this contract.

C. Payment. The Contractor and the third party shall agree that all payments due under this contract shall be made upon submittal of payment requests to the third party in accordance with the terms and conditions of an agreement between the Contractor, the Contractor's financial agent (if any), and the third party and its agents (if any). No payment shall be due the Contractor until such agreement is made. Payments made or due by the third party under this clause are not payments made by the NAFI and are not subject to the Prompt Payment Act or any implementation thereof in this contract.

D. Documentation. Documentation of each charge against the NAFI's account shall be provided to the Contracting Officer upon request.

E. Assignment of claims. Notwithstanding any other provision of this contract, if any payment is made under this clause, then no payment under this contract shall be assigned under the provisions of the assignment of claims terms of this contract or the Assignment of Claims Act of 1940, as amended, 31 U.S.C. 3727, 41 U.S.C. 15.

F. Other payment terms. The other payment terms of this contract shall govern the content and submission of payment requests. If any clause requires information or documents in or with the payment request, which is not provided in the third party agreement referenced in paragraph "C" of this clause, the Contractor shall obtain instructions from the Contracting Officer before submitting such a payment request.

I-38 PERMITS AND RESPONSIBILITIES

The Contractor shall, without additional expense to the NAFI, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, State, and municipal laws, codes and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and property of others. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work, which may have been accepted under the contract.

I-39 REMOVAL OF CONTRACTOR'S EMPLOYEES

The Contractor agrees to utilize only experienced, responsive and capable people in the performance of the work. The Contracting Officer may require that the Contractor remove employees who endanger persons or property, or whose continued employment under this contract is inconsistent with the interest of military security.

I-40 SAVE HARMLESS

The Contractor shall save indemnify, save harmless and defend the NAF, its outlets and customer from any liability, claimed or established for violation or infringement of any copyright or trademark right asserted by a third party with respect to goods hereby ordered or any part thereof. Also the contractor shall at all times hold and save harmless the NAFI, its agents, representatives, and employees from any and all suits and expenses which rise out of acts or omissions of the contractor, its agents, or employees.

I-41 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are hereby incorporated by reference in this contract.

I-42 DISPUTES CONCERNING LABOR STANDARDS

The United States Department of Labor has set forth in 29 CFR Parts 5, 6 and 7 procedures for resolving disputes concerning labor standards requirements. Such disputes shall be resolved in accordance with those procedures and not the Disputes clause of this contract. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or employees or their representatives.

I-43 CONTRACT TERMINATION-DEBARMENT

A breach of the contract clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act--Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Subcontracts (Labor Standards), Compliance with Davis-Bacon and Related Act Regulations, or Certification of Eligibility may be grounds for termination of the contract and for debarment as a Contractor and subcontractor.

I-44 DIFFERING SITE CONDITIONS

A. The contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature,

which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract.

B. The Contracting Officer shall investigate the site conditions, promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly.

C. No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in "A" above for giving written notice may be extended by the Contracting Officer.

D. No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

I-45 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK

A. The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work, or its cost, including but not limited to (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the NAFI, as well as from drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the NAFI.

B. The NAFI assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the NAFI. Nor does the NAFI assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers, employees, or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

I-46 OPERATIONS AND STORAGE AREAS

A. The Contractor shall confine all operations (including storage of materials) on NAFI or Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government and the NAFI, its officers, employees, and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

B. Temporary buildings (e.g., storage sheds, shops, offices, etc.) and utilities may be erected by the Contractor only with the approval of the Contracting Officer, and shall be built with labor and materials furnished by the Contractor without expense to the NAFI. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the contractor at the contractor's expense.

upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

I-47 CLEANING UP

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any rubbish, tools, scaffolding, equipment, and materials that are not the property of the NAFI or the Government. Upon completing the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer.

I-48 SUSPENSION OF WORK

A. The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the NAFI.

B. If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified) an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract.

C. A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of the final payment under the contract.

I-49 OTHER CONTRACTS

The NAFI or the Government may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with NAFI and Government employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by NAFI or Government employees.

I-50 NOTICE TO THE NAFI OF LABOR DISPUTES

A. If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice, including all relevant information, to the Contracting Officer.

B. The Contractor agrees to insert the substance of this clause, including this paragraph “B”, in any subcontract to which a labor dispute may delay the timely performance of this contract; except that each such subcontract shall provide that in the event its timely performance is delayed or threatened by delay by an actual or potential labor dispute, the subcontractor shall immediately notify the next higher tier subcontractor or the prime Contractor, as the case may be, of all relevant information with respect to such dispute.

I-51 IDENTIFICATION OF CONTRACTOR'S EMPLOYEES

A. The Contractor without expense to the NAFI shall provide for each employee, working on this contract, an identification badge as may be approved and directed by the Contracting Officer. Each such employee shall be required to wear his badge upon his person at all times while on duty at the site of work or at other times and places where identification is required, and in such manner that it will be plainly visible as a means of identification. If required by the Contracting Officer, the Contractor shall obtain fingerprints and other means of identification for all such employees.

B. In the event the NAFI desires registration of all employees working on this project, the Contractor shall cause them to be registered at such place and in such manner as the Contracting Officer may direct. Upon notification that registration is to be affected, the Contractor shall not permit any employee to work on the job site until such employee has completed the required registration.

I-52 SCHEDULES FOR CONSTRUCTION CONTRACTS

A. The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work schedules for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule.

B. The Contractor shall enter the actual progress on the chart as directed by the Contracting Officer, and upon doing so shall immediately deliver three copies of the annotated schedule to the Contracting Officer. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take such steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the NAFI. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of the construction plan, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

C. Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for determination by the Contracting Officer that the Contractor is not prosecuting the

work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of the contract.

I-53 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

B. The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site, and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

I-54 TIME EXTENSIONS

Time extensions for contract changes will depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The change order granting the time extension may provide that the contract completion date will be extended only for those specific elements related to the changed work and that the remaining contract completion dates for all other portions of the work will not be altered. The change order also may provide an equitable readjustment of liquidated damages under the new completion schedule.

I-55 INCONSISTENCY BETWEEN ENGLISH VERSION AND TRANSLATION OF CONTRACT

In the event of inconsistency between any terms of this contract and any translation thereof into another language, the English language meaning shall control.

I-56 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK

The Contractor will be required to (a) commence work under this contract within seven calendar days (unless otherwise specified within this contract) after the date of receipt by him of notice to proceed, (b) to prosecute work diligently, and (c) to complete the entire work, ready for use not later than the time specified in the terms of the contract. The time stated for completion shall include final clean up of the premises.

I-57 CLEAN AIR AND WATER (Applicable to contracts in excess of \$100,000)

A. "Air Act," as used in this clause, means the Clean Air Act (42 U.S.C. 7401, et seq.).

1. "Clean air standards," as used in this clause, means--

- a. Any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, work practices, or other requirements contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738;
- b. An applicable implementation plan as described in section 110(d) of the Air Act (42 U.S.C. 7410(d));
- c. An approved implementation procedure or plan under section 111(c) or section 111(d) of the Air Act (42 U.S.C. 7411(c) or (d)); or
- d. An approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 7412(d)).

2. "Clean water standards," as used in this clause, means any enforceable limitation, control, condition, prohibition, standard, or other requirement promulgated under the Water Act or contained in a permit issued to a discharge by the EPA or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

3. "Compliance," as used in this clause, means compliance with--

- a. Clean air or water standards; or
- b. A schedule or plan ordered or approved by a court of competent jurisdiction, the EPA, or an air or water pollution control agency under the requirements of the Air Act or Water Act and related regulations.

4. "Facility," as used in this clause, means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a Contractor or subcontractor, used in the performance of a contract or subcontract. When a location or site of operations includes more than one building, plant, installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the EPA determines that independent facilities are collocated in one geographical area.

5. "Water Act," as used in this clause, means Clean Water Act (33 U.S.C. 1251, et seq.).

B. The Contractor agrees--

1. To comply with the requirements of section 114 of the Clean Air Act (42 U.S.C. 7414) and section 308 of the Clean Water Act (33 U.S.C. 1318) relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, and all regulations and guidelines issued to implement those acts before the award of this contract;

2. That no portion of the work required by this prime contract Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of the facility from the listing;

3. To use best efforts to comply with clean air standards and clean water standards at the facility in which the contract is being performed; and

4. To insert the substance of this clause into any nonexempt subcontract, including this subparagraph "B.4".

I-58 COMPOSITION OF CONTRACTOR

If the Contractor hereunder is comprised of more than one legal entity, each such entity shall be jointly and severally liable hereunder.

I-59 SUPERINTENDENCE BY CONTRACTOR

At all times during the performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

I-60 USE AND POSSESSION PRIOR TO COMPLETION

A. The NAFI or the Government shall have the right to take possession of any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the NAFI or the Government intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall relieve the Contractor of responsibility for complying with the terms of the contract. The NAFI's or the Government's possession or use shall not be deemed an acceptance of any work under the contract.

B. While the NAFI or the Government has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the NAFI's or the Government's possession or use, notwithstanding the terms of the clause in this contract entitled "Permits and Responsibilities." If prior possession or use by the NAFI or the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

I-61 AVAILABILITY AND USE OF UTILITY SERVICES

A. The Government/NAFI shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the Government/NAFI or, where the Government/NAFI, at reasonable rates determined by the Contracting Officer, produces the utility. The Contractor shall carefully conserve any utilities furnished without charge.

B. The Contractor, at its expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges.

C. Before final acceptance of the work by the Government/NAFI, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

I-62 APPRENTICES AND TRAINEES

A. Apprentices.

1. An apprentice will be permitted to work at less than the predetermined rate for the work performed when employed—

- a. Pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer, and Labor Services (OATELS) or with a State Apprenticeship Agency recognized by the OATELS; or
 - b. In the first 90 days of probationary employment as an apprentice in such an apprenticeship program, even though not individually registered in the program, if certified by the OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.
2. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program.
3. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph (a)(1) of this clause, shall be paid not less than the applicable wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.
4. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination.
5. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.
6. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

B. Trainees.

1. Trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer, and Labor Services (OATELS). The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by OATELS.
2. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full

amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the OATELS shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed.

3. In the event OATELS withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

C. Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended.

I-63 PAYROLLS AND BASIC RECORDS

A. Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under paragraph (d) of the clause entitled Davis-Bacon Act, that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

B. 1. The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The Prime Contractor is responsible for the submission of copies of payrolls by all subcontractors.

2. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify--

- a. That the payroll for the payroll period contains the information required to be maintained under paragraph "A" of this clause and that such information is accurate and complete;

- b. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions; and
 - c. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
3. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph "B.2" of this clause.
4. The falsification of any of the certifications in this clause may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

C. The Contractor or subcontractor shall make the records required under paragraph "A" of this clause available for inspection, copying, or transcription by the Contracting Officer or authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit the Contracting Officer or representatives of the Contracting Officer or the Department of Labor to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action.

I-64 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION

A. The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

B. Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

C. Where "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place" that is "furnished and installed".

D. Shop drawings means drawings, submitted to the Government/NAFI by the Contractor, subcontractor, or any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements, and (2) the installation (i.e., fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the contractor to explain in detail specific portions of the work required by the contract. The Government/NAFI may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

E. If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government/NAFI's reasons therefore. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with "F" below.

F. If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

G. The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. The Contracting Officer will retain three sets (unless otherwise indicated) of all shop drawings and return the other set to the Contractor.

H. This clause shall be included in all subcontracts at any tier.

I-65 LAYOUT OF WORK

The Contractor shall layout its work from established base lines and benchmarks indicated on the drawings furnished by the NAFI, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor through its negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

I-66 DAVIS-BACON ACT

A. All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor

under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph "D" of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such period. Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled Apprentices and Trainees. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph "B" of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

B. 1. The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefore only when all the following criteria have been met:

- a. The work to be performed by the classification requested is not performed by a classification in the wage determination.
- b. The classification is utilized in the area by the construction industry.
- c. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- d. With respect to helpers, such a classification prevails in the area in which the work is performed.

2. If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator or an authorized representative will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

3. In the event the Contractor, the laborers or mechanics to be employed in the classification, or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

4. The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs "B.2 and B.3" of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

C. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

D. If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

I-67 WITHHOLDING OF FUNDS

The Contracting Officer shall, upon his or her own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

I-68 SUBCONTRACTS (LABOR STANDARDS)

A. The Contractor or subcontractor shall insert in any subcontracts the clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act-Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Withholding of Funds, Subcontracts (Labor Standards), Contract Termination-Debarment, Disputes Concerning Labor Standards, Compliance with Davis-Bacon and Related Act Regulations, and Certification of Eligibility, and such other clauses as the Contracting Officer may, by appropriate instructions, require, and also a clause requiring subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited in this paragraph.

B. 1. Within 14 days after award of the contract, the Contractor shall deliver to the Contracting Officer a completed Statement and Acknowledgment Form (SF 1413) for each subcontract, including the subcontractor's signed and dated acknowledgment that the clauses set forth in paragraph "A" of this clause have been included in the subcontract.

2. Within 14 days after the award of any subsequently awarded subcontract, the Contractor shall deliver to the Contracting Officer an updated completed SF 1413 for such additional subcontract.

I-69 LABOR STANDARDS FOR CONSTRUCTION WORK--FACILITIES CONTRACTS

A. In the event that construction, alteration, or repair (including painting and decorating) of public buildings or public works is to be performed hereunder, the Contractor shall comply with the following listed clauses in performance of such work: (1) Contract Work Hours and Safety Standards Act-Overtime Compensation; (2) Davis-Bacon Act; (3) Withholding of Funds; (4) Payrolls and Basic Records; (5) Apprentices and Trainees; (6) Compliance with Copeland Act Requirements; (7) Subcontracts (Labor Standards); (8) Contract Termination-Debarment; (9) Compliance with Davis-Bacon and Related Act Regulations; (10) Disputes Concerning Labor Standards; and (11) Certification of Eligibility.

B. Upon determination by the Contracting Officer that the Davis-Bacon Act is applicable to any item of work to be performed hereunder, a determination of the prevailing wage rates shall be incorporated into the contract by modification.

C. No construction, alteration, or repair (including painting and decorating) of public buildings or public works shall be performed under this contract without incorporation of the wage determination unless the Contracting Officer authorizes the start of work because of unusual or emergency situations, in which case the wage determination shall be incorporated as soon as possible and made retroactive to the start of the work.

I-70 ANTI-KICKBACK PROCEDURES

A. Definitions.

1. "Kickback," as used in this clause, means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided, directly or indirectly, to any prime Contractor, prime Contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a subcontract relating to a prime contract.

2. "Person," as used in this clause, means a corporation, partnership, business association of any kind, trust, joint-stock company, or individual.

3. "Prime contract," as used in this clause, means a contract or contractual action entered into by the United States for the purpose of obtaining supplies, materials, equipment, or services of any kind.

4. "Prime Contractor" as used in this clause, means a person who has entered into a prime contract with the United States.

5. "Prime Contractor employee," as used in this clause, means any officer, partner, employee, or agent of a prime Contractor.

6. "Subcontract," as used in this clause, means a contract or contractual action entered into by a prime Contractor or subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind under a prime contract.

7. "Subcontractor," as used in this clause, (1) means any person, other than the prime Contractor, who offers to furnish or furnishes any supplies, materials, equipment, or services of any kind under a prime contract or a subcontract entered into in connection with such prime contract, and (2) includes any person who offers to furnish or furnishes general supplies to the prime Contractor or a higher tier subcontractor.

8. "Subcontractor employee," as used in this clause, means any officer, partner, employee, or agent of a subcontractor.

B. The Anti-Kickback Act of 1986 (41 U.S.C. 51-58) (the Act), prohibits any person from-

1. Providing or attempting to provide or offering to provide any kickback;

2. Soliciting, accepting, or attempting to accept any kickback; or

3. Including, directly or indirectly, the amount of any kickback in the contract price charged by a prime Contractor to the United States or in the contract price charged by a subcontractor to a prime Contractor or higher tier subcontractor.

C. 1. The Contractor shall have in place and follow reasonable procedures designed to prevent and detect possible violations described in paragraph "B" of this clause in its own operations and direct business relationships.

2. When the Contractor has reasonable grounds to believe that a violation described in paragraph "B" of this clause may have occurred, the Contractor shall promptly report in writing the possible violation. Such reports shall be made to the inspector general of the contracting agency, the head of the contracting agency if the agency does not have an inspector general, or the Department of Justice.

3. The Contractor shall cooperate fully with any Federal agency investigating a possible violation described in paragraph "B" of this clause.

4. The Contracting Officer may (i) offset the amount of the kickback against any monies owed by the United States under the prime contract and/or (ii) direct that the Prime Contractor withhold from sums owed a subcontractor under the prime contract the amount of the kickback. The Contracting Officer may order that monies withheld under subdivision (c)(4)(ii) of this clause be paid over to the Government/NAFI unless the Government/NAFI has already offset those monies under subdivision (c)(4)(i) of this clause. In either case, the Prime Contractor shall notify the Contracting Officer when the monies are withheld.

5. The Contractor agrees to incorporate the substance of this clause, including subparagraph "C.5" but excepting subparagraph "C.1", in all subcontracts under this contract which exceed \$100,000.

I-71 PERFORMANCE AND PAYMENT BONDS

A. Definitions. As used in this clause – "Original contract price" means the award price of the contract; or for indefinite-quantity contracts, the price payable for the specified minimum quantity. Original contract price does not include the price of any options, except those options exercised at the time of contract award.

B. Within ten (10) calendar days after the contractor receives notification of contract award, the Contractor shall obtain and submit to the Contracting Officer two (2) bonds (namely "Performance" and "Payment" Bonds, each with good and sufficient surety or sureties acceptable to the Fund.

C. If the contractor, upon acceptance of its bid or proposal by the fund within the period specified for acceptance, fails to execute all contractual documents or give performance and payment bonds as required by the contract within the time specified, the Contracting Officer may terminate the contract for default.

D. Navy regulation applicable to Nonappropriated funds require performance and payment bonds for any construction contract exceeding \$100,000 unless an applicable waiver applies. The Contractor shall furnish to the Fund a Performance Bond (Standard Form 25) and a Payment Bond (Standard Form 25-A) within 10 days after award of contract before receiving a Notice to Proceed with the work or being allowed to start work. The Bonds shall include a statement that states that “The term United States of America, as set forth in this bond form shall mean the United States Nonappropriated Fund Instrumentality (herein after referred to as the Navy, Morale, Welfare, and Recreation Fund) which is a party to this contract.” The penal sums of such bonds shall be as follows:

1. Performance Bonds (Standard Form 25): The penal sum of the performance bonds at the time of contract award shall be 100% of the original contract price.
2. Payment Bonds (Standard Form 25A): The penal sum of the payment bonds at the time of contract award shall be 100% of the original contract price.
3. Additional bond protection
 - a. The NAFI may require additional performance and payment bond protection if the contract price is increased. The increase in protection generally will equal 100 percent of the increase in contract price.
 - b. The NAFI may secure the additional protection by directing the contractor to increase the penal amount of the existing bond or to obtain an additional bond.

E. Corporate sureties offered for bonds furnished with your award contract must appear on the list contained in the Department of Treasury Circular 570, “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies”. Treasury Circular 570 is published in the Federal Register or may be obtained from the web site from the Department of the Treasury. The penal amount of the bond should not exceed the surety’s underwriting limit, the bond will be acceptable only if (i) the amount which exceeds the specified limit is coinsured or reinsured and (ii) the amount of coinsurance or reinsurance does not exceed the underwriting limit of each coinsurer or reinsurer.

F. Individual sureties will not be acceptable under the requirements of this contract.

G. Notice of subcontractor waiver of protection (40 U.S.C. 270b(c)). Any waiver of the right to sue on the payment bond is void unless it is in writing, signed by the person whose right is waived, and executed after such person has first furnished labor or material for use in the performance of the contract.

I-72 RESERVED

I-73 STOP-WORK ORDER

A. The contracting officer may, at any time, by written order to the contractor, require the contractor to stop all, or any part, of the work called for by this contract for a period of 90 days after the order is delivered to the contractor, and for any further period to which the parties may agree. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Within a period of 90 days after a stop-work is delivered to the contractor, or within any extension of that period to which the parties shall have agreed, the contracting officer shall either –

1. Cancel the stop-work order; or
 2. Terminate the work covered by the order as provided in the Default, or the Termination for Convenience, clause of this contract.
- B. If a stop-work order issued under this clause is cancelled or the period of the order any extension thereof expires, the contractor shall resume work. The contracting officer shall make an equitable adjustment in the delivery schedule or contract price, or both, and the contract shall be modified, in writing. Accordingly, if –
1. The stop-work order results in an increase in the time required for, or in the contractor's cost properly allocable to, the performance of any part of this contract; and
 2. The contractor asserts its right to the adjustment within 30 days after the end of the period of work stoppage; provided that, if the contracting officer decides the facts justify the action, the contracting officer may receive and act upon the claim submitted at any time before final payment under this contract.
- C. If a stop-work order is not cancelled and the work covered by the order is terminated for the convenience of the NAFI, the contracting officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.
- D. If a stop-work order is not cancelled and the work covered by the order is terminated for default, the contracting officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

I-74 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS

- A. The NAFI shall pay the contract price as provided in this contract.
- B. The NAFI may make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments. In the preparation of estimates the Contracting Officer may authorize material delivered on the site may also be taken into consideration if—
1. Consideration is specifically authorized by this contract; and
 2. The Contractor furnished satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.
- C. Contractor certification. Along with each request for progress payments, the Contractor shall furnish the following certification, or payment shall not be made: (However, if the Contractor elects to delete paragraph "C.4" from the certification, the certification is still acceptable.)
I hereby certify, to the best of my knowledge and belief, that—
1. The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

2. Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of chapter 39 of Title 31, United States Code;

3. This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract; and

4. This certification is not to be construed as final acceptance of a subcontractor's performance.

(Name)

(Title)

(Date)

D. Refund of unearned amounts. If the Contractor, after making a certified request for progress payments, discovers that a portion or all of such request constitutes a payment for performance by the Contractor that fails to conform to the specifications, terms, and conditions of this contract (hereinafter referred to as the "unearned amount"), the Contractor shall—

1. Notify the Contracting Officer of such performance deficiency; and

2. Be obligated to pay the NAFI an amount (computed by the Contracting Officer in the manner provided in paragraph "J" of this clause) equal to interest on the unearned amount from the 8th day after the date of receipt of the unearned amount until—

- a. The date the Contractor notifies the Contracting Officer that the performance deficiency has been corrected; or
- b. The date the Contractor reduces the amount of any subsequent certified request for progress payments by an amount equal to the unearned amount.

E. If the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer shall authorize payment to be made in full. However, if satisfactory progress has not been made, the Contracting Officer may retain a maximum of 10 percent of the amount of the payment until satisfactory progress is achieved. When the work is substantially complete the Contracting Officer may retain from previously withheld funds and future progress payments that amount the Contracting Officer considers adequate for protection of the NAFI and shall release to the Contractor all the remaining withheld funds. Also, on completion and acceptance of each separate building, public work or other division of the contract, for which the price is stated separately in the contract, payment shall be made for the completed work without retention of a percentage.

F. All material and work covered by progress payments made shall, at the time of payment, become the sole property of the NAFI, but this shall not be construed as—

1. Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

2. Waiving the right of the NAFI to require the fulfillment of all of the terms of the contract.

G. In making these progress payments, the NAFI shall, upon request, reimburse the Contractor for the amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after the Contractor has furnished evidence of full payment to the surety. The retainage provisions in paragraph (c) above shall not apply to that portion of progress payments attributable to bond premiums.

H. The NAFI shall pay the amount due the Contractor under this contract after—

1. Completion and acceptance of all work;

2. Presentation of a properly executed voucher; and

3. Presentation of release of all claims against the NAFI arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned under the assignment of Claims clause of this contract.

I. Notwithstanding any other provision of this contract, progress payments shall not exceed eighty percent (80%) on work accomplished on undefinitized contract actions. A "contract action" is any action resulting in a contract, as defined in BUPERSINST 7043.1B, including contract modifications for additional supplies, services or construction, but not including contract modifications that are within the scope and under the terms of the contract, such as contract modifications issued pursuant to the Changes clause, or funding and other administrative changes.

I-75 PRECONSTRUCTION CONFERENCE

If the Contracting Officer decides to conduct a preconstruction conference, the successful offeror will be notified and will be required to attend. The Contracting Officer's notification will include specific details regarding the date, time, and location of the conference, any need for attendance by subcontractors, and information regarding the items to be discussed.

I-76 BANKRUPTCY

In the event the Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary, the Contractor agrees to furnish, by certified mail or electronic commerce method authorized by the contract, written notification of the bankruptcy to the Contracting Officer responsible for administering the contract. This notification shall be furnished within five days of the initiation of the proceedings relating to the bankruptcy filing. This notification shall include the date on which the bankruptcy petition was filed, the identity of the court in which the bankruptcy petition was filed, and a listing of Government/NAFI contract numbers and contracting offices for all Government/NAFI contracts against which final payment has not been made. This obligation remains in effect until final payment under this contract.

I-77 CONTRACTING OFFICER AUTHORITY

In no event shall any understanding or agreement between the Contractor and any Government/NAFI employee other than the Contracting Officer on any contract, modification, change order, letter or verbal direction to the Contractor be effective or binding upon the NAFI. All such actions must be formalized by a proper contractual document executed by an appointed Contracting Officer. The Contractor is

hereby put on notice that in the event a Government/NAFI employee other than the Contracting Officer directs change in the work to be performed or increases the scope of work to be performed, it is the Contractor's responsibility to make inquiry of the Contracting Officer before making the deviation. Payments will not be made without being authorized by an appointed Contracting Officer with the legal authority to bind the NAFI.

I-78 ORDER OF PRECEDENCE

Any inconsistency in this solicitation shall be resolved by giving precedence in the following order: (1) the Schedule (excluding the specifications), (2) Representations and Other Instructions, (3) Contract Clauses, (4) Section C – Specifications and Work Statement, (5) Other Documents, Exhibits and Attachments, and (6) the Contractor's technical proposal, if incorporated by reference elsewhere in the contract

I-79 NOT USED

I-80 NOT USED

I-81 NOT USED

I-82 NOT USED

I-83 PRIVACY ACT NOTIFICATION

The Contractor will be required to design, develop, or operate a system of records on individuals, to accomplish an agency function subject to the Privacy Act of 1974, Public Law 93-579, December 31, 1974 (5 U.S.C. 552a) and applicable agency regulations. Violations of the Act may involve the imposition of criminal penalties.

I-84 PRIVACY ACT

A. The Contractor agrees to-

1. Comply with the Privacy Act of 1974 (the Act) and the agency rules and regulations issued under the Act in the design, development, or operation of any system of records on individuals to accomplish an agency function when the contract specifically identifies-

- a. The systems of records; and
- b. The design, development, or operation work that the contractor is to perform;

2. Include the Privacy Act notification contained in this contract in every solicitation and resulting subcontract and in every subcontract awarded without a solicitation, when the work statement in the proposed subcontract requires the redesign, development, or operation of a system of records on individuals that is subject to the Act; and

3. Include this clause, including this subparagraph (3), in all subcontracts awarded under this contract which requires the design, development, or operation of such a system of records.

B. In the event of violations of the Act, a civil action may be brought against the agency involved when the violation concerns the design, development, or operation of a system of records on individuals to accomplish an agency function, and criminal penalties may be imposed upon the officers or employees of the agency when the violation concerns the operation of a system of records on individuals to accomplish

an agency function. For purposes of the Act, when the contract is for the operation of a system of records on individuals to accomplish an agency function, the Contractor is considered to be an employee of the agency.

C. 1. “Operation of a system of records,” as used in this clause, means performance of any of the activities associated with maintaining the system of records, including the collection, use, and dissemination of records.

2. “Record,” as used in this clause, means any item, collection, or grouping of information about an individual that is maintained by an agency, including, but not limited to, education, financial transactions, medical history, and criminal or employment history and that contains the person’s name, or the identifying number, symbol, or other identifying particular assigned to the individual, such as a fingerprint or voiceprint or a photograph.

3. “System of records on individuals,” as used in this clause, means a group of any records under the control of any agency from which information is retrieved by the name of the individual or by some identifying number, symbol, or other identifying particular assigned to the individual.

I-85 NOT USED

I-86 NOT USED

END OF SECTION 1

SECTION J

Section J contains a variety of information including the following:

Section J - 1	Project Plans
Section J - 2	Temporary Environmental Controls
Section J - 3	Project Sign
Section J - 4	DD Form 1354
Section J - 5	EFT Vendor Payment Enrollment Form
Section J - 6	RFI Form

SECTION J-1

PROJECT PLANS

Enclosed is a CD with the detailed construction plans for the project site.

SECTION J-2

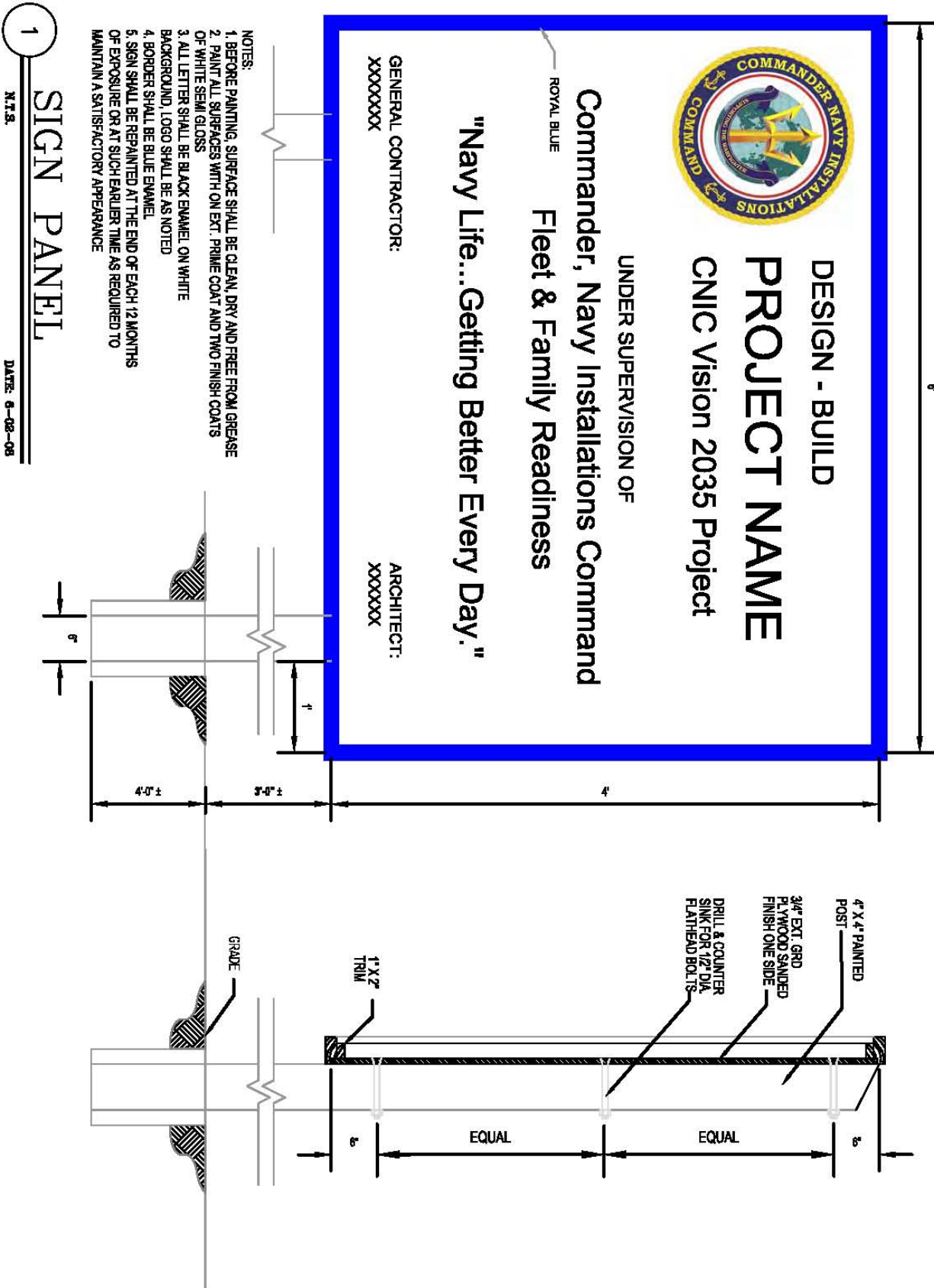
TEMPORARY ENVIRONMENTAL CONTROLS

Attached are Temporary Environmental Controls that must be adhered to at the project site.

SECTION J-3

SITE CONSTRUCTION SIGN

During construction, the Contractor will supply, erect, and maintain a project sign at the site in accordance with the attached sign guidelines.



SECTION J-4

DD FORM 1354

At the conclusion of the project, the contractor shall complete the attached DD Form 1354 for the project site.

TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY														Form Approved OMB No. 0704-0188							
														PAGE	OF	PAGES					
<p>The public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Executive Service and Communications Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p> <p>PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE ABOVE ORGANIZATION.</p>																					
1. FROM (Installation/Activity/District and ZIP Code)			2. DATE PREPARED (YYYYMMDD)			3. PROJECT/JOB NUMBER			4. SERIAL NUMBER			9. TRANSACTION DETAILS									
5. TO (Installation/Activity/Service, ZIP Code & INSNO)			6. SITE/INSNO/ NAME			7. CONTRACT NUMBER(S)			8. DRAWING NUMBER(S)			a. <input type="checkbox"/> NEW CONST. <input type="checkbox"/> EXISTING FAC. <input type="checkbox"/> CAPITAL IMP. <input type="checkbox"/> OTHER (Specify)			b. <input type="checkbox"/> PHYS. COM. AVAIL. <input type="checkbox"/> BENF/O <input type="checkbox"/> PARTIAL BOD <input type="checkbox"/> FINANCIAL COM. <input type="checkbox"/> OTHER (Specify)						
												c. <input type="checkbox"/> DRAFT <input type="checkbox"/> FINAL <input type="checkbox"/> INTERIM			d. EFFECTIVE DATE (YYYYMMDD)						
10. ITEM NO.	11. FACILITY NO.	12. CATEGORY CODE	13. CATCODE DESCRIPTION	14. TYPE	15. UNIT OF MEAS 1	16. TOTAL QUANTITY UM 1	17. UNIT OF MEAS 2	18. TOTAL QUANTITY UM 2	19. COST	20. FUND SOURCE	21. FUND ORG	22. INTER-EST CODE	23. ITEM REMARKS								
24. STATEMENT OF COMPLETION. The facilities listed hereon are in accordance with maps, drawings, and specifications and change orders approved by the authorized representative of the using agency except for the deficiencies listed on the reverse side.														25. a. ACCEPTED BY (Typed Name and Signature)				b. DATE SIGNED (YYYYMMDD)			
a. TRANSFERRED BY (Typed Name and Signature)														b. DATE SIGNED (YYYYMMDD)							
c. TITLE (Area Engr./Base Engr./DPW)														c. TITLE (DPW/RPAQ)				26. PROPERTY VOUCHER NUMBER			

27. CONSTRUCTION DEFICIENCIES (attach blank sheet for continuations)

28. PROJECT REMARKS (attach blank sheet for continuations)

INSTRUCTIONS

GENERAL. This form has been designed and issued for use in connection with the transfer of military real property between the military departments and to or from other government agencies. It supersedes ENG Forms 290 and 290B (formerly used by the Army and Air Force) and NAVDOCKS Form 2317 (formerly used by the Navy).

Existing instructions issued by the military departments relative to the preparation of DD Form 1354 are applicable to this revised form to the extent that the various items and columns on the superseded forms have been retained. The military departments may promulgate additional instructions, as appropriate.

For detailed instructions on how to fill out this form, please refer to Unified Facilities Criteria (UFC) 1-300-08, dated 17 December 2003.

SPECIFIC DATA ITEMS.

1. **From.** Name and address of the transferring agency.
2. **Date Prepared.** Date of actual preparation. Enter all dates in YYYYMMDD format (Example: March 31, 2004 = 20040331).
3. **Project/Job Number.** Project number on a DD Form 1391 or Individual Job Order Number.
4. **Serial Number.** Sequential serial number assigned by the preparing organization (e.g., 2004-0001).
5. **To.** Name and address of the receiving installation, activity, and service of the Real Property Accountable Officer (RPAO).
6. **Site/INSNO and Name.** Site or installation number and site name where the constructed facility is located.
7. **Contract Number(s).** Contract number(s) for this project.
8. **Drawing Number(s).** Drawing number(s) or CAD identifier(s) for project components.
9. **Transaction Details.**
 - a. **Type of Transaction.** Mark (X) only one box.
 - b. **When/Event.** When or event causing preparation of DD Form 1354. X only one box.
 - c. **Version.** Draft, interim, or final DD Form 1354. X only one box.
 - d. **Effective Date.** Effective date for transaction; start date for depreciation.
10. **Item Number.** Use a separate item number for each facility, no item number for additional usages.

11. **Facility Number.** Unique facility number identified in Real Property Inventory.

12. **Category Code.** The category code describes the facility usage.

13. **Barcode Description.** The category code name which describes the facility usage.

14. **Type.** Type of construction: P for Permanent; S for Semipermanent; T for Temporary.

15. **Area: Unit of Meas 1.** Area unit of measure; use SF, SY, AC only.

16. **Total Quantity UM 1.** The total area for the measure identified in item 15. Use negative numbers for demolition.

17. **Other: Unit of Meas 2.** Unit of Measure 2 is the capacity or other measurement unit (e.g., LF, MB, EA, etc.).

18. **Total Quantity UM 2.** The total capacity/other for the measure identified in item 17.

19. **Cost.** Cost for each facility; for capital improvements to existing facilities, show amount of increase only.

20. **Fund Source.** Enter the Fund Source Code for this item, i.e., 01-MILCON, 02-BRAC, 03-O&M, etc.

21. **Funding Organization.** Enter the code for the organization responsible for replacing this facility at the end of its useful life, i.e., 00-Army Active, 01-Army Reserve, 02-Army National Guard, etc.

22. **Interest Code.** Enter the code that reflects government interest or ownership in the facility, i.e., 01-Owned by DoD, 02-Owned by Federal Government (non-DoD), etc.

23. **Item Remarks.** Remarks pertaining only to the item number identified in item 10; show cost sharing.

24. **Statement of Completion.** Typed name, signature, title, and date of signature by the responsible transferring individual or agent.

25. **Accepted By.** Typed name, signature, title, and date of signature by the RPAO or accepting official.

26. **Property Voucher Number.** Next sequential number assigned by the RPAO in voucher register.

27. **Construction Deficiencies.** List construction deficiencies in project during contractor turnover inspection.

28. **Project Remarks.** Project level remarks, continuation of blocks, and used to explain "other" entries in item 9.

SECTION J-5

EFT VENDOR PAYMENT ENROLLMENT FORM

The following form shall be used by the contractor to enroll in the electronic payment system that will be used for this project.

**EFT VENDOR PAYMENT ENROLLMENT FORM FOR
MORALE, WELFARE AND RECREATION (MWR) OR BACHELOR HOUSING (BH)**

This form is used for Automated Clearing House (ACH) payments.
Please complete and return this form as soon as possible.

PRIVACY ACT STATEMENT

The following information is provided to comply with the Privacy Act of 1974 (P.L. 93-579). All information collected on this form is required under the provisions of 31 USC 3332, as amended by the Debt Collection Improvement Act of 1996 (P.L. 104-134) and 31 CFR 208. This information will be used by the Commander Navy Installations Command, Morale, Welfare and Recreation Division, to electronically transmit payment data to your financial institution. Failure to provide the requested information may delay or prevent the receipt of payments through the Automated Clearing House Payment System.

Please complete the EFT Form below and return to:

Address:

Commander Navy Installations Command
Facilities/Acquisitions Branch N944S1
Attn: (b) (6)
5720 Integrity Drive
Millington, TN 38055

Phone:

Commercial: (901) (b) (6)
FAX: (901) (b) (6)
E-mail: (b) (6)

Vendor: Select who you do business with: ☐ MWR and/or ☐ BH

Company Accounts Receivable Information

Name:

TIN/EIN/SSN:

Street Address:

City:

State:

ZIP Code:

Contact
Person:

Phone:

FAX:

E-mail:

Financial Institution Information

Name:

Address:

ACH Coordinator Name:

Phone:

ABA Routing Number:

Bank Account Holder Name:

Account Holders Bank Account Number:

Account Type:

Checking ☐

Savings ☐

Signature of Company Official:

Date:

Title of Company Official:

SECTION J-6

RFI FORM

The following form shall be used by the contractor to submit Request for Information inquiries.

REQUEST FOR INFORMATION

			RFI NUMBER:
			MOD#:
CONTRACT NUMBER:		CNIC PM:	ATTACHMENTS: YES: _____ NO: _____
PROJECT TITLE AND LOCATION:			ISSUED DATE:
TITLE OR SECTION OF WORK:			RESPONSE NEEDED BY: _____ COST EFFECT: YES _____ NO _____ TIME EFFECT: YES _____ NO _____
DWG NO.:	SPEC. NO.:	WRITTEN DESCRIPTION OF PROBLEM:	ISSUED BY:
DWG. NO.:	SPEC NO.:	A/E or CONTRACTOR PROPOSED SOLUTION:	ESTIMATED COST or SAVINGS
	CO	Obtain Contractor's Proposal: _____ Date: _____	
ROUTE	ACCEPTED or DENIED	COMMENTS:	APPROVING OFFICIAL/DATE
DM			
FM			
RA			
COR			
PM			
	DATE:	CONTRACTING OFFICER SIGNATURE:	APPROVED or DENIED:

**NAS MERIDIAN
PONTA CREEK GOLF CLUBHOUSE
MERIDIAN, MISSISSIPPI**

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SECTION 01010 SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RPF Sections and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of additions and renovations to an existing building.
 - 1. Project Location: Ponta Creek Golf Club, Allen Road, NAS, Meridian, Mississippi.
- B. Contract Documents, dated June 18, 2010 were prepared for the Project by JBHM Architects, PA, 104 Third Street South, Columbus, Mississippi.
- C. The Work consists of concrete foundation, wood framing, masonry, structural, framing, mechanical, plumbing, electrical, kitchen equipment, roofing, and interior finishes.
- D. The Work will be constructed under a single prime contract.

1.3 WORK UNDER OTHER CONTRACTS

- A. Separate Contract: The NAVFAC may award separate contracts for performance of certain construction operations at the site. Those operations will be conducted simultaneously with work under this Contract. That Contract may include the following:
 - 1. Contract: Asbestos Containing Material removal
- B. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.4 WORK SEQUENCE

- A. The Work will be conducted in a single phase.

1.5 CONTRACTOR USE OF PREMISES

- A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within temporary fenced areas indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
 - 1. NAFI Occupancy: Allow for NAFI occupancy and use by the public.
 - 2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the NAFI, the NAFI's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.6 OCCUPANCY REQUIREMENTS

- A. Partial NAFI Occupancy: The NAFI reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.
1. The NAFI will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to NAFI occupancy.
 2. Obtain a Certificate of Occupancy from local building officials (Public Works Department) prior to NAFI occupancy.
 3. Prior to partial NAFI occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the NAFI will operate and maintain mechanical and electrical systems serving occupied portions of the building.
 4. Upon occupancy, the NAFI will assume responsibility for maintenance and custodial service for occupied portions of the building.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01010

SECTION 01040 COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Cleaning and protection.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Field Engineering" specifies procedures for field engineering services, including establishment of benchmarks and control points.
 - 2. Division 1 Section "Project Meetings" for progress meetings, coordination meetings, and pre-installation conferences.
 - 3. Division 1 Section "Submittals" for preparing and submitting the Contractor's Construction Schedule.
 - 4. Division 1 Section "Materials and Equipment" for coordinating general installation.
 - 5. Reference RFP for coordinating contract closeout.
 - 6. Reference Sections H & I for additional coordination requirements.

1.3 COORDINATION

- A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
 - 3. Make provisions to accommodate items scheduled for later installation.

- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for the NAFI and separate contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project closeout activities.
- D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.
 - 1. Show the relationship of components shown on separate Shop Drawings.
 - 2. Indicate required installation sequences.
 - 3. Comply with requirements contained in Section "Submittals."
- B. Staff Names: Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.
 - 1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.
- C. Coordinate scheduling, submittals, and Work of the various Sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- D. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean up of Work of separate Sections in preparation for substantial Completion and for portions of Work designated for NAFI's partial occupancy.
- H. After NAFI occupancy of premises, coordinate access to site for correction of effective Work and Work not in accordance with Contract Documents, to minimize disruption of NAFI's activities.

3.2 CLEANING AND PROTECTION

- A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.
- B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
- C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
 - 1. Excessive static or dynamic loading.
 - 2. Excessive internal or external pressures.
 - 3. Excessively high or low temperatures.
 - 4. Thermal shock.

5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Puncture.
11. Abrasion.
12. Heavy traffic.
13. Soiling, staining, and corrosion.
14. Bacteria.
15. Rodent and insect infestation.
16. Combustion.
17. Electrical current.
18. Improper lubrication.
19. Unusual wear or other misuse.
20. Contact between incompatible materials.
21. Destructive testing.
22. Misalignment.
23. Excessive weathering.
24. Unprotected storage.
25. Improper shipping or handling.
26. Theft.
27. Vandalism.

END OF SECTION 01040

SECTION 01045 CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for cutting and patching.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Coordination" for procedures for coordinating cutting and patching with other construction activities.
 - 2. Division 2 Section "Selective Demolition" for demolition of selected portions of the building for alterations.
 - 3. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - a. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 15 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
 - 1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
 - a. Foundation construction.
 - b. Bearing and retaining walls.
 - c. Structural concrete.
 - d. Structural steel.
 - e. Lintels.
 - f. Timber and primary wood framing.
 - g. Structural decking.
 - h. Stair systems.
 - i. Miscellaneous structural metals.
 - j. Exterior curtain-wall construction.
 - k. Equipment supports.
 - l. Piping, ductwork, vessels, and equipment.
 - m. Structural systems of special construction in Division 13 Sections.

- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Membranes and flashings.
 - e. Fire protection systems.
 - f. Noise and vibration control elements and systems.
 - g. Control systems.
 - h. Communication systems.
 - i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction in Division 13 Sections.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the NAFI's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.
1. If possible retain the original Installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Processed concrete finishes.
 - b. Stonework and stone masonry.
 - c. Ornamental metal.
 - d. Matched-veneer woodwork.
 - e. Preformed metal panels.
 - f. Firestopping.
 - g. Window wall system.
 - h. Stucco and ornamental plaster.
 - i. Acoustical ceilings.
 - j. Terrazzo.
 - k. Finished wood flooring.
 - l. Fluid-applied flooring.
 - m. Carpeting.
 - n. Aggregate wall coating.
 - o. Wall covering.
 - p. Swimming pool finishes.
 - q. HVAC enclosures, cabinets, or covers.

1.4 WARRANTY

- A. **Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.**

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
 - 1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
 4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
 5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.
 4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.4 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01050 FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for field-engineering services including, but not limited to, the following:
 - 1. Land survey work.
 - 2. Civil-engineering services.
 - 3. Damage surveys.
 - 4. Geotechnical monitoring.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 1 Section "Submittals" for submitting Project record surveys.
 - 3. Division 1 Section "Project Closeout" for submitting final property survey with Project Record Documents and recording of NAFI-accepted deviations from indicated lines and levels.

1.3 SUBMITTALS

- A. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections.

1.4 QUALITY ASSURANCE

- A. Surveyor Qualifications: Engage a land surveyor registered in the state where the Project is located, to perform required land-surveying services.
- B. Engineer Qualifications: Engage an engineer of the discipline required, licensed in the state where the Project is located, to perform required engineering services.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Identification: Refer to Sheet A100 for limits of construction and Sheet C100 for control points.
- B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
 - 1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
 - 2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.
- C. Establish and maintain a minimum of 2 permanent benchmarks on the site, referenced to data established by survey control points.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.
 - 1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.

3.2 PERFORMANCE

- A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
 - 1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
 - 2. As construction proceeds, check every major element for line, level, and plumb.
- B. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference.
 - 1. Record deviations from required lines and levels, and advise the NAFI when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
- C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.

- D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.
- E. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

END OF SECTION 01050

SECTION 01200 PROJECT MEETINGS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section. Reference Section H-8 for Coordination Conferences.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
 - 1. Preconstruction conferences.
 - 2. Preinstallation conferences.
 - 3. Progress meetings.
 - 4. Coordination meetings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Coordination" for procedures for coordinating project meetings with other construction activities.
 - 2. Division 1 Section "Submittals" for submitting the Contractor's Construction Schedule.
 - 3. Division 7 Section "Roofing" for preinstallation roofing conferences.

1.3 PRECONSTRUCTION CONFERENCE

- A. Reference Section I-75 Pre-Construction Conference

1.4 PREINSTALLATION CONFERENCES

- A. Reference Section H-8 Coordination Conference

1.5 MONTHLY PROGRESS MEETINGS

- A. Conduct progress meetings at the Project Site on a monthly basis. Notify the NAFI of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: In addition to representatives of the NAFI, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.
 - 1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
 - 2. Review the present and future needs of each entity present, including the following:
 - a. Interface requirements.
 - b. Time.
 - c. Sequences.
 - d. Status of submittals.
 - e. Deliveries.
 - f. Off-site fabrication problems.
 - g. Access.
 - h. Site utilization.
 - i. Temporary facilities and services.
 - j. Hours of work.
 - k. Hazards and risks.
 - l. Housekeeping.
 - m. Quality and work standards.
 - n. Change Orders.
 - o. Documentation of information for payment requests.
- D. Reporting: No later than 3 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - 1. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.6 CONTRACT CLOSEOUT MEETING:

- A. Reference Section E-2 Contract Closeout
- B. Attendees – Authorized representatives of the NAFI, Contractor and any other personnel involved in maintenance and operation of all systems in the project.
- C. Agenda – Discuss items of significance affecting contract closeout:
 - 1. Section 01700 Contract Closeout.
 - 2. Request for Final Inspection.
 - 3. Final change orders and contingency allowance.
 - 4. Project record documents, operations and maintenance.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01200

SECTION 01300 SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Submittal schedule.
 - 3. Daily construction reports.
 - 4. Shop Drawings.
 - 5. Product Data.
 - 6. Samples.
 - 7. Quality assurance submittals.
- B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
 - 1. Permits.
 - 2. Applications for Payment.
 - 3. Performance and payment bonds.
 - 4. Insurance certificates.
 - 5. List of subcontractors.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section G, "Contract Administration Data" addresses requirements for submittal of the Schedule of Values.
 - 2. Section I-64, "Specifications and Drawings for Construction" specifies requirements governing preparation and submittal of required Coordination Drawings.
 - 3. Section H-8, "Coordination Conferences" specifies requirements for submittal and distribution of meeting and conference minutes.
 - 4. Section H-26, "Contractor Quality Control/Quality Assurance" specifies requirements for submittal of inspection and test reports.
 - 5. Section E-2, "Pre-Final and Final Inspection" specifies requirements for submittal of Project Record Documents and warranties at project closeout.

1.3 DEFINITIONS

- A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.
 - 1. Preparation of Coordination Drawings is specified in Division 1 Section "Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.
- B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.
- C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

1.4 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The NAFI reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
 - 3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
 - a. Allow 21 days for initial review. Allow additional time if the NAFI must delay processing to permit coordination with subsequent submittals.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow 21 days for reprocessing each submittal.
 - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the NAFI sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 - 1. Provide a space approximately 4 by 5 inches (100 by 125 mm) on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 - 2. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of the NAFI.
 - d. Name and address of the Contractor.

- e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
- C. **Submittal Transmittal:** Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the NAFI using a transmittal form. The NAFI will not accept submittals received from sources other than the Contractor.
 - 1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
 - 2. Transmittal Form: Use AIA Document G810 or similar.
- D. **Quantity of Submittals:** The Contractor shall submit multiple copies of each submittal as required including drawings, product data, and color samples as follows:
 - 1. One copy will be retained by the NAFI.
 - 2. One copy will be retained by the consulting engineer (as applicable).
 - 3. One copy will be retained by the Contractor for use in close out documents.
 - 4. One copy will be retained by the Contractor for office records.
 - 5. One copy will be retained by the Contractor for use on site.
 - 6. The Contractor shall submit additional copies as needed for distribution to subcontractors, coordination, or other purposes.
 - 7. See Division 15 Mechanical and Division 16 Electrical for number of submittals and additional requirements.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Reference Sections H-24 and I-52
- B. Phasing: On the schedule, show how requirements for phased completion to permit Work by separate Contractors and partial occupancy by the NAFI affect the sequence of Work.
- C. Work Stages: Indicate important stages of construction for each major portion of the Work, including submittal review, testing, and installation.
- D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.
- E. Cost Correlation: At the head of the schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of Work performed as of the dates used for preparation of payment requests.
 - 1. Refer to Division 1 Section "Applications for Payment" for cost reporting and payment procedures.

- F. Distribution: Following response to the initial submittal, print and distribute copies to the NAFI, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- G. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.6 SUBMITTAL SCHEDULE

- A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for submittal of the Contractor's Construction Schedule.
 - 1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor's Construction Schedule.
 - 2. Prepare the schedule in chronological order. Provide the following information:
 - a. Scheduled date for the first submittal.
 - b. Related Section number.
 - c. Submittal category (Shop Drawings, Product Data, or Samples).
 - d. Name of the subcontractor.
 - e. Description of the part of the Work covered.
 - f. Scheduled date for resubmittal.
 - g. Scheduled date for the NAFI's final release or approval.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the NAFI, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.7 SHOP DRAWINGS

- A. Reference Section H-26

1.8 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
3. Distribution: Furnish copies of all submittals to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
 - a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.9 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 1. Mount or display Samples in the manner to facilitate review of qualities indicated. Prepare Samples to match the architect's sample. Include the following:
 - a. Specification Section number and reference.
 - b. Generic description of the Sample.
 - c. Sample source.
 - d. Product name or name of the manufacturer.
 - e. Compliance with recognized standards.
 - f. Availability and delivery time.
 2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 - c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
 - d. Samples not incorporated into the Work, or otherwise designated as the NAFI's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

3. Preliminary Submittals: Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices.
 - a. The NAFI will review and return preliminary submittals with the NAFI's notation, indicating selection and other action.
 4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 3 sets. The NAFI will return one set marked with the action taken.
 5. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
1. Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.
 - a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.10 QUALITY ASSURANCE SUBMITTALS

- A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
 1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.
- C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control."

1.11 NAFI'S ACTION

- A. Reference Section H-26

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01300

SECTION 01320 PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Request for Information procedures
 - 3. Conservation.
 - 4. Coordination Drawings.
 - 5. Administrative and supervisory personnel.
 - 6. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section H-26 for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.
- C. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for NAFI and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Request for Information.
 7. Preinstallation conferences.
 8. Project closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.4 REQUEST FOR INFORMATION

- A. Request for Information (RFI) Procedures: If the General Contractor has questions requiring additional information or further explanation regarding the Construction Documents the General Contractor shall prepare a request for information memoranda (find enclosed RFI Form in these specifications, Section 01320) to be sent to the NAFI for a response. By submitting this RFI, the general contractor represents that he has used due diligence to ascertain the information herein and that he is unable to answer the question without the NAFI's assistance. If the NAFI deems that the response can easily be obtained from the plans and specifications then the NAFI may invoice the contractor at a reasonable rate.
- B. In addition to the request, the General Contractor shall provide pertinent related information with the request for the NAFI's review.
1. The contractor shall keep an RFI log at the job site and at the contractor's home office throughout the duration of the project.
 2. The NAFI shall respond within a reasonable time to retrieve the required information as appropriate to the request.
 3. The General Contractor shall distribute copies to each party involved and shall coordinate to insure information has been passed on to all by parties involved so

that information is received in a timely matter as not to delay the project schedule or cause any undue cost to the NAFI.

- B. Prepare similar Request for Information memoranda for separate contractors if coordination of their Work is required. Copy to the NAFI.

1.5 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Indicate relationship of components shown on separate Shop Drawings.
 - 2. Indicate required installation sequences.
 - 3. Refer to Division 15 Section "Basic Mechanical Materials and Methods" and Division 16 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.
- B. Staff Names: Within **15** days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
 - 1. Include special personnel required for coordination of operations with other contractors.

1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify NAFI of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including NAFI, within **3** days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to NAFI, but no later than **15** days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of NAFI, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.
 - q. Progress cleaning.
 - r. Working hours.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise NAFI of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.

- e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements.
 - 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at **monthly** intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to representatives of NAFI, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.

- 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 14) Request for information log status
 - 15) Documentation of information for payment requests.
3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Conduct Project coordination meetings at **regular** intervals as appropriate to the stages of construction. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
- 1. Attendees: In addition to representatives of NAFI, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.

- 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01320

SECTION 01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including RFP Sections and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Water service and distribution.
 - 2. Temporary electric power and light.
 - 3. Temporary heat.
 - 4. Ventilation.
 - 5. Telephone service.
 - 6. Sanitary facilities, including drinking water.
- C. Support facilities include, but are not limited to, the following:
 - 1. Field offices and storage sheds.
 - 2. Temporary roads and paving.
 - 3. Dewatering facilities and drains.
 - 4. Temporary enclosures.
 - 5. Temporary project identification signs and bulletin boards.
 - 6. Waste disposal services.
 - 7. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Temporary fire protection.
 - 2. Barricades, warning signs, and lights.
 - 3. Sidewalk bridge or enclosure fence for the site.
 - 4. Environmental protection.

1.3 SUBMITTALS

- A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.4 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building code requirements.

2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.

- B. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the NAFI, change over from use of temporary service to use of permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the NAFI, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
- C. Water: Provide potable water approved by local health authorities.
- D. Open-Mesh Fencing: Provide 0.120-inch- thick, galvanized 2-inch chainlink fabric fencing 6 feet high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches I.D. for line posts and 2-1/2 inches I.D. for corner posts.

2.2 EQUIPMENT

- A. General: Provide new equipment. If acceptable to the NAFI, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 3/4-inch, heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets

equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

- D. **Electrical Power Cords:** Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- E. **Lamps and Light Fixtures:** Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- F. **Heating Units:** Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
- G. **Temporary Offices:** Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.
- H. **Temporary Toilet Units:** Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- I. **Fire Extinguishers:** Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. **General:** Contact the NAFI, or engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of

the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 3. Obtain easements to bring temporary utilities to the site where the NAFI's easements cannot be used for that purpose.
 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the NAFI. Neither the NAFI will accept cost or use charges as a basis of claims for Change Orders.
- B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
1. Sterilization: Sterilize temporary water piping prior to use.
- C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
1. Install electric power service underground, except where overhead service must be used.
 2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.
1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
- E. Temporary Heat: Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
- F. Heating Facilities: Except where the NAFI authorizes use of the permanent system, provide vented, self-contained, LP-gas or fuel-oil heaters with individual space thermostat control.
1. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.

- G. Temporary Telephones: Provide temporary telephone service throughout the construction period for all personnel engaged in construction activities. Install telephone on a separate line for each temporary office and first-aid station.
 - 1. Separate Telephone Lines: Provide additional telephone lines for the following:
 - a. Where an office has more than 2 occupants, install a telephone for each additional occupant or pair of occupants.
 - b. Provide a dedicated telephone line for a fax machine in the field office.
 - 2. At each telephone, post a list of important telephone numbers.
- H. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
 - 1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
- I. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
 - 1. Provide separate facilities for male and female personnel.
- J. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
 - 1. Filter out excessive amounts of soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
 - 2. Connect temporary sewers to the municipal system, as directed by sewer department officials.
 - 3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.
- K. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
 - 1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will

be permitted to use permanent facilities, under conditions acceptable to the NAFI.

- B. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet of building lines. Comply with requirements of NFPA 241.
- C. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project Site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:
 - 1. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase.
 - 2. Equip with a water cooler and private toilet complete with water closet, lavatory, and medicine cabinet unit with a mirror.
- D. Storage and Fabrication Sheds: Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site.
- E. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.
- F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
 - 1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - 2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. or less with plywood or similar materials.
 - 3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 - 4. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.
- G. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.
 - 1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated. Install 14 days after Notice to Proceed.
 - 2. Temporary Signs: Refer to Section J.
 - 3. See attached sign layout.

- H. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.
- I. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.
- J. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the NAFI.
- B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
 - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 - 2. Store combustible materials in containers in fire-safe locations.
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 - 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- C. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
- D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- E. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.
 2. Provide plywood fence, 8 feet high, framed with four 2-by-4-inch rails, and preservative-treated wood posts spaced not more than 8 feet apart.
 3. Fencing use may be waived by NAFI.
- F. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- G. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the NAFI requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the Contractor's property. The NAFI reserves the right to take possession of project identification signs.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of

- plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts subject to unusual operating conditions.
 - c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 01500

SECTION 01740 WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Submittals" specifies procedures for submitting warranties.
 - 2. Division 1 Section "Contract Closeout" specifies contract closeout procedures.
 - 3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.
 - 4. Certifications and other commitments and agreements for continuing services to NAFI are specified elsewhere in the Contract Documents.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the NAFI.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the NAFI.

1.4 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the NAFI has benefited from use of the Work through a portion of its anticipated useful service life.
- D. NAFI's Recourse: Expressed warranties made to the NAFI are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the NAFI can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The NAFI reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the NAFI reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

- A. Submit written warranties to the NAFI prior to the date certified for Final Completion. If the NAFI's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the NAFI.
 - 1. When a designated portion of the Work is completed and occupied or used by the NAFI, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the NAFI within 15 days of completion of that designated portion of the Work.
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the NAFI, for approval prior to final execution.
- C. Forms for special warranties are included at the end of this Section. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Submit a draft to the NAFI, for approval prior to final execution.
 - 1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

- D. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- E. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 - 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.1 LIST OF WARRANTIES

- A. Schedule: Provide warranties on products and installations as specified in each Section.

END OF SECTION 01740

DIVISION 2 - SITE CONSTRUCTION

02050	CONSTRUCTION STAKING
02070	SELECTIVE DEMOLITION
02200	EXCAVATION AND BACKFILL
02221	CRUSHED STONE AND GRAVEL
02230	SITE CLEARING
02270	SLOPE PROTECTION AND EROSION CONTROL
02300	EARTHWORK
02361	TERMITE CONTROL
02751	CEMENT CONCRETE PAVEMENT
02930	VEGETATION

SECTION 02050 – CONSTRUCTION STAKING**PART 1 - GENERAL****1.01 REQUIREMENTS INCLUDED**

- A. The Contractor shall provide and pay for field engineering services for:
 - 1. Survey work required in layout and execution of work
 - 2. Civil, structural, or other professional Engineering services specified or required to execute the Contractor's construction method
- B. The method of field staking for the construction of the work shall be at the option of the Contractor. The NAFI shall provide surveys to establish reference points which in his judgment are necessary to enable the Contractor to proceed with his work.
- C. The accuracy of any method of staking shall be the responsibility of the Contractor. All NAFI work for establishing vertical and horizontal control shall be the responsibility of the Contractor.
- D. The Contractor shall be held responsible for the preservation of all stakes and marks. If any stakes or marks are carelessly or willfully disturbed by the Contractor, the Contractor shall not proceed with any work until he has reestablished such points, marks, lines and elevations as may be necessary for the prosecution of the work.
- E. The Contractor shall retain the services of a competent surveyor registered in the State of Mississippi to lay out the work and maintain a survey during construction. The Contractor shall be solely responsible for proper location of the work.

1.02 SURVEY REFERENCE POINTS

- A. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
- B. Make no changes or relocations without prior written notice to the NAFI.
- C. Report to the NAFI when any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations.
- D. Require surveyor to replace control points which may be lost or destroyed. Establish replacements based on original survey control.

1.03 PROJECT SURVEY REQUIREMENTS

- A. Establish temporary bench marks as needed, referenced to data established by survey control points. Record locations, with horizontal and vertical data, on Record Drawings.

- B. Establish lines and levels, and locate and lay out, by instrumentation and similar appropriate means:
 - 1. Site improvements, including utility slopes and invert elevations.
 - 2. Batter boards for structures.
 - 3. Controlling lines and levels required for mechanical and electrical trades.
- C. From time to time, verify layouts by same methods.
- D. Establish all lines and grades prior to construction of pipe work for all pipelines at 100 foot increments.
- E. Earthwork: If excavation (unclassified, excess or borrow) are to be measured for payment and paid based on field measured quantities then the Contractor shall complete the following task for payment:

Prior to commencement of work Contractor shall survey all area denoted on the drawings requiring excavation or placement of fill and provide the NAFI with a sealed topographic survey of these areas by a land surveyor licensed in the State of MS. At the completion of the project when all fill and excavated areas are compacted, dress and accepted the contractor shall survey areas requiring excavation and placement of fill for final measurement of unclassified excavation, borrow excavation and excess excavation. Survey(s) shall be absorbed in the cost of excavation line items.

1.04 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.
- B. At contract closeout, submit a survey of installation of structures, site topography, and pipelines at the same scale as the NAFI's drawings indicating elevations and pipe stationing at 100 foot increments and at all valve, structure, and appurtenance locators.

1.05 SUBMITTALS

- A. On request of the NAFI, submit documentation to verify accuracy of field engineering work.
- B. Submit drawings showing locations of all pipes and structures constructed. This drawing shall be included with the record drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 02050

SECTION 02070 SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of a building.
 - 2. Demolition and removal of selected site elements.
 - 3. Patching and repairs.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Summary of Work" for use of the building and phasing requirements.
 - 2. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
 - 3. Division 1 Section "Construction Facilities and Temporary Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for selective demolition operations.
 - 4. Section H-16, "Record (As-Built) Drawings" for record document requirements.
 - 5. Division 2 Section "Site Clearing" for site clearing and removing above- and below-grade improvements.
 - 6. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
 - 7. Division 6 Section "Rough Carpentry" for material and construction requirements for temporary enclosures.
 - 8. Division 9 Section "Gypsum Board Assemblies" for material and construction requirements for temporary enclosures.
 - 9. Division 15 Sections for cutting, patching, or relocating mechanical items.
 - 10. Division 16 Sections for cutting, patching, or relocating electrical items.

1.3 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the property of the NAFI.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain the NAFI's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain NAFI property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option. Prior to demolition NAFI shall identify items to remain the property of NAFI. Any such items identified shall be carefully removed and delivered to NAFI.
- B. Historical items indicated remain the NAFI's property. Carefully remove and salvage each item in a manner to prevent damage and deliver promptly to NAFI.
- C. Historical items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to NAFI, which may be encountered during selective demolition, remain NAFI property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to NAFI.
 - 1. Cooperate with NAFI's archaeologist or historical adviser.

1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Conform with all local, state and federal requirements.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with pre-installation conference requirements of Division 1 Section "Project Meetings."

1.6 PROJECT CONDITIONS

- A. NAFI will vacate building and occupy temporary facilities in the parking lot adjacent the building. Conduct demolition and construction activities so that NAFI's operations will not be disrupted.
- B. NAFI assumes no responsibility for actual condition of buildings to be selectively demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by NAFI as far as practical.

- C. Storage or sale of removed items or materials on-site will not be permitted.

1.7 SCHEDULING

- A. Arrange selective demolition schedule so as not to interfere with NAFI's on-site operations.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to NAFI.
- E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.

- a. Provide not less than 72 hours' notice to NAFI if shutdown of service is required during changeover.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
 - 1. Coordinate termination of utilities with Public Works Department.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
 - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.
- C. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from NAFI and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
 - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
 - 5. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
 - 6. Cover and protect furniture, furnishings, and equipment that have not been removed.

- D. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

8. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 10. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.
 - C. Break up and remove concrete slabs on grade, unless otherwise shown to remain.
 - D. Remove resilient floor coverings and adhesive according to recommendations of the Resilient Floor Covering Institute's (RFCI) "Recommended Work Practices for the Removal of Resilient Floor Coverings" and Addendum.
 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
 - E. Remove no more existing roofing than can be covered in the same day by new roofing. See applicable Division 7 Section for new roofing requirements.
 - F. Remove air-conditioning equipment without releasing refrigerants.
- 3.6 PATCHING AND REPAIRS
- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.
 - B. Patching is specified in Division 1 Section "Cutting and Patching."
 - C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
 1. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material, applied according to manufacturer's printed recommendations.
 - D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
 - E. Patch and repair floor and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.
 1. Closely match texture and finish of existing adjacent surface.
 2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
4. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
5. Inspect and test patched areas to demonstrate integrity of the installation, where feasible.

- F. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off NAFI property and legally dispose of them.

3.8 CLEANING

- A. Sweep the building broom clean on completion of selective demolition operation.
- B. Change filters on air-handling equipment on completion of selective demolition operations.

3.9 HAZARDOUS MATERIALS

- A. Notify NAFI if materials suspected to contain hazardous materials are uncovered in the process of demolition work. Such materials will be analyzed and removed by qualified environmental engineers / abatement contractors selected by the Public Works Department to perform such analysis and removal as conditions require.
 1. Where demolition is required, Contractor is to comply with current Mississippi Department of Environmental Quality and Federal Environmental Protection Agency (NESHAPS and OSHA0 requirements for removal and disposal.

END OF SECTION 02070

SECTION 02200 – EXCAVATION AND BACKFILL

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. The Contractor shall furnish all labor, materials, equipment and incidentals required to perform all excavating, backfilling and disposing of earth materials as shown, specified, and required for the purpose of constructing conduits, pipelines, roads, ditches, grading, and other facilities required to complete the Work in every respect.
 - 2. All necessary preparation of subgrade for slabs and pavements is included.
 - 3. All temporary means needed to prevent discharge of sediment to water courses because of dewatering systems or erosion are included.
 - 4. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof.
- B. Related Work Specified Elsewhere:
 - 1. Section 02230, Site Clearing
 - 2. Section 15052, Buried Piping Installation
 - 3. Section H-14, Safety

1.02 QUALITY ASSURANCE

- A. Tests:
 - 1. The Contractor shall retain the services of a qualified testing laboratory to make tests and determine acceptability of the soil as listed below.
 - 2. The Contractor shall give full cooperation to the testing lab personnel so that the required soil tests can be taken in an efficient and timely manner.
 - 3. Required Tests:
 - a. Select Backfill Samples:
 - (1) Gradation, ASTM D 422
 - (2) Liquid Limit, ASTM D 423
 - (3) Plastic Limit and Plasticity Index, ASTM D 424
 - b. Compacted Select Backfill: Compaction, ASTM D 698
- B. Permits and Regulations:
 - 1. The Contractor shall obtain all necessary permits for work in roads, rights-of-way, railroads, etc.
 - 2. The Contractor shall obtain permits as required by local, state and federal agencies for discharging water from excavations to rivers and streams.
 - 3. The Contractor shall perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

- C. Reference Standards: The Contractor shall comply with applicable provisions and recommendations of the following except as otherwise shown or specified.
1. ASTM A 36, Structural Steel.
 2. ASTM A 328, Steel Sheet Piling
 3. ASTM D 422, Particle-Size Analysis of Soils
 4. ASTM D 423, Liquid Limit of Soils
 5. ASTM D 424, Plastic Limit and Plasticity Index of Soils
 6. ASTM D 448, Standard Sizes of Coarse Aggregate for Highway Construction
 7. ASTM D 698, Moisture-Density Relations of Soils, Using 5.5 lb (2.5 kg) Rammer and 12 inch (304.8 mm) Drop
 8. ASTM D 1556, Density of Soil in Place by the Sand-Cone Method
 9. ASTM D 2487, Classification of Soils for engineering Purposes
 10. ASTM D 2922, Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.03 SUBMITTALS

The Contractor shall submit samples of all general backfill, select fill, and pipe bedding materials required.

1.04 JOB CONDITIONS

Subsurface Information:

- A. Test borings and other exploratory operations may be made by Contractor at no cost to NAFI.
- B. Existing Structures and Utilities:
1. Shown on the Drawings are certain surface and underground structures adjacent to the Work. This information has been obtained from existing records. It is not guaranteed to be correct or complete and is shown for the convenience of the Contractor. Contractor shall explore ahead of the required excavation to determine the exact location of all structures. All structures shall be supported and protected from injury by the Contractor. If they are broken or damaged, they shall be restored immediately by the Contractor at his expense.
 2. The Contractor shall locate existing underground utilities in the areas of Work. If utilities are to remain in place, the Contractor shall provide adequate means of protection during earthwork operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the NAFI immediately for directions as to procedure. Cooperate with the NAFI and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility NAFI.
 3. Do not interrupt existing utilities serving facilities occupied and used by the NAFI or others, except when permitted in writing by the NAFI's representative and then only after acceptable temporary utility services have been provided.
 4. If it is determined that existing utilities are to be relocated by the Owner of those utilities the Contractor shall be responsible for the

coordination of the relocation. Contractor shall notify utility Owner in sufficient time to avoid delays to the Contractor's schedule.

- C. Use of Explosives: Not permitted on the job site.
- D. Protection of Persons and Property:
 - 1. Barricade open excavations occurring as part of this Work and post with warning lights.
 - 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 - 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1.05 POLLUTION CONTROL

- A. The Contractor shall take all necessary precautions and measures to control, minimize, and remedy the generation of objectionable dust or materials/spoils spillage. Such measures shall include but not be limited to water spraying of aggregate stockpiles, tarpaulin-covered truck beds, minimizing of mud tracking by haul vehicle tires, and maintenance/cleaning of access roads, entry areas, and connecting roadways. No separate payment will be made for control of dust and materials/spoils spillage.
- B. The Contractor shall clean adjacent structures and improvements of all dust, dirt, and debris caused by operations as directed by the NAFI's Representative. Areas shall be returned to conditions existing prior to the start of work.
- C. The Contractor shall provide stone roadways on site and for exiting the site when necessary to prevent tracking of mud and debris onto roadways.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Select Backfill and Fill Material
 - 1. Select Backfill of trenches material shall be Class II, or III as classified by ASTM D2321.
 - a. Class II shall be coarse-grained soils borderline clean to with fines. (e.g. GW-GC, SP-SM)
 - b. Class III shall be coarse grained soils with fines. (e.g. GM, GC, SM & SC)
 - 2. Select Fill: Class V, Group C per Section 703.21 of the Mississippi Standard Specifications for Road and Bridge Construction, unless otherwise noted on drawings.
- B. General Backfill and Fill Material: Provide approved soil materials for backfill and fill that meet the following requirements.
 - 1. Free of clay, rock or gravel larger than 6" in any dimensions, debris, waste, frozen materials, vegetable and other deleterious matter.

2. Fill shall consist of any non-organic soil, free of debris and capable of being placed and compacted to the specified densities.
3. Unsuitable soil material shall include soils which contain: vegetative matter, sod, roots, rubbish, highly clay soils of the CH and MH descriptions, borderline soils of SH-CH descriptions, and organic soils.

C. Pipe Bedding:

1. Select bedding material used around and under flexible pipes shall be well graded sand (SW or GW), crushed limestone or Class IB as classified by ASTM D2321. Should limestone or Class IB material be used it shall conform to the gradation set out below:

Sieve Size	% Passing by Weight
1 1/2"	100%
No. 4	≤ 50%
No. 200	< 5%

In addition, should ground water be encountered in the trench, the Class IB material shall be provided as a filter material in accordance with Section XI.8 of ASTM D2321 and shall have the following gradation requirements:

- a. $D_{15}/d_{85} < 5$ where D_{15} is the sieve opening size passing 15% by weight of the coarser material (bedding) and d_{85} is the sieve opening size passing 85% by weight of the finer material.
- b. $D_{50}/d_{50} < 25$ where D_{50} is the sieve opening size passing 50% by weight of the coarser material (bedding) and d_{50} is the sieve opening size passing 50% by weight of the finer material.
- c. If the finer material is a medium to highly plastic clay without sand or silt partings (CL or CH) then the following criteria may be used in lieu of the above:
 $D_{15} < 0.02$, where D_{15} is the sieve opening size passing 15% by weight of the coarser material.

2. Select bedding material used around and under rigid pipes shall be crushed limestone or conforming to the gradation set out below:

Sieve Size	% Passing by Weight
1 1/2"	100%
No. 4	≤ 50%
No. 200	< 5%

PART 3 - EXECUTION

3.01 INSPECTION

The Contractor will examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the NAFI of conditions the Contractor may find that are detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 SITE PREPARATION

- A. Clear all areas to be occupied by permanent construction of all trees, brush, roots, stumps, logs, wood, and other materials and debris in accordance with Section 02230. Subgrades for fills shall be cleaned and stripped of vegetation, sod, topsoil, and organic matter.
- B. Lay out and maintain grade stakes as required. Reference layout work to base lines, property lines, easement and/or right-of-way as indicated.
- C. Where new grades tie into existing grades, verify existing grades. If existing conditions are at variance with the Drawings, notify the NAFI before proceeding with the work and make adjustments only as directed by the NAFI.
- D. The NAFI shall approve all fill materials. The Contractor shall remove from site any material found unsuitable by NAFI at no addition cost to the NAFI.

3.03 TEST PITS

- A. Where ordered by the NAFI's representative, the Contractor shall excavate and backfill, in advance of construction, test pits to determine conditions or location of existing facilities.
- B. The Contractor shall perform all work required in connection with excavating, stockpiling, maintaining, sheeting, shoring, backfilling and replacing pavement for the test pits.
- C. Test pits made by the Contractor for his own use at his option shall not be a pay item.

3.04 EXCAVATION

- A. General:
 - 1. Scope: Perform all excavation required to complete the Work as shown and specified.
 - 2. Excavated Materials: Earth, sand, clay, gravel, hardpan, boulders not requiring drilling or jackhammering to remove, decomposed rock, pavements, sediment, rubbish and all other materials within the excavation limits.

3. Excavation shall be carried to the contours and dimensions indicated on plans and typical sections in the Drawings. Excavations shall be kept free from water while construction therein is in progress. All excavated material which is unsatisfactory for backfill or site grading shall be removed from the site. In the event it is necessary to excavate unsuitable material in addition to that specified or indicated, the NAFI shall be notified and a negotiated adjustment in the contract price made, in accordance with the Contract, prior to excavations. Excavations carried below the depths indicated, without specific directions, shall, except as otherwise specified, be backfilled to the proper grade with suitable material and compacted as specified hereinafter; all at the Contractor's expense.
 4. In excavations below the water table, it shall be the Contractor's responsibility to provide safe excavations, free of caving and heaving. It shall also be the Contractor's responsibility to provide adequate dewatering of excavations at no extra cost to the NAFI.
- B. Structures and Pipelines:
Excavations: Open excavations shall be constructed to prevent injury to workmen and to new and existing structures or pipelines. All open excavation shall comply with current OSHA requirements.
- C. Dewatering:
1. Placement Below Groundwater Table: Use well points, cofferdams or other acceptable methods to permit construction of said structure or pipeline under dry conditions.
 2. Pipelines: Maintain dry conditions until the pipelines are properly jointed and backfilled.
 3. Water Level: Maintain water level below trench bottom at all times.
 4. Under no conditions shall water be permitted to stand in the bottom of an excavation for more than 24 hours.
 5. The use of sanitary sewers for disposal of water from dewatering operations is prohibited.
- D. Pumping: Pump excavations in such a manner to prevent the carrying away of unsolidified concrete materials and to prevent damage to the existing subgrade.
- E. Size of Excavations: Extend excavation sufficiently on each side of structures, footings, and all other similar items, to permit setting of forms, installation of sheeting, the safe sloping of banks, and all other similar activities.
- F. Subgrades:
1. Subgrade Requirements for Fill Areas, Roadways, Structures and Trench Bottoms:
 - a. Strong, dense, and thoroughly compacted and consolidated
 - b. Free from mud, muck and other soft or unsuitable materials
 - c. Remain firm and intact under all construction operations
 - d. The Contractor shall excavate to the lines and grades shown on plans and typical sections in the Drawings

2. All subgrades shall be proof-rolled with a loaded dump truck or other suitable equipment approved by the NAFI. Any area that "pumps" is considered a soft subgrade and shall be corrected as specified in paragraph 3.04.F.3.
3. Soft Subgrades: Subgrades which are otherwise solid, but which become soft or mucky on top due to construction operations, shall be removed and replaced or processed to establish a stable surface. Soft area shall be proof-rolled after corrective action has been taken.
4. All submerged roots, stumps, or other perishable matter encountered in the preparation of the subgrade shall be completely removed down to natural undisturbed soil backfilled in controlled compacted lifts with select fill.
5. After the subgrade has been prepared as specified above, it shall be maintained in such condition so as to drain. If damaged by the Contractor's subsequent operations, the subgrade shall be scarified and recompact. Subsequent courses shall not be placed until the subgrade has been approved by the NAFI.
6. Finished Elevation of Stabilized Subgrades: Do not place finished elevation of stabilized subgrades above subgrade elevations shown on the Drawings.

G. Stability of Excavations:

1. Sides of Excavations: Slope sides of excavations to comply with codes and ordinances of agencies having jurisdiction.
2. Shoring and Bracing: Shore and brace excavations where sloping is not possible either because of space restrictions or stability of material excavated. Comply with all OSHA requirements for bracing and shoring of excavations.
3. Safety: Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
4. Caving: If caving occurs outside the excavation area, backfill the resulting hole in accordance with the requirements of this section after removing the loose material.

H. Pipe Trench Excavation and Preparation:

1. Trenches shall be excavated so that pipes can be laid straight at uniform grade, without dips or humps, between the terminal elevations indicated on the drawing.
2. The Contractor shall not open more trench in advance of culvert laying than is necessary to expedite the work nor shall unfilled trench be more than can be properly backfilled at the end of each workday. Furthermore, the maximum length of trench left open shall not exceed 100'.
3. Except where jacking and boring is indicated on the drawings, is specified, or is permitted by the NAFI's representative, all trench excavation shall be open cut from the surface.
4. Alignment, Grade, and Minimum Cover. The Alignment and grade or elevation of each pipeline shall be as indicated on the contract drawings. Vertical and horizontal alignment of pipes and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the section covering installation of pipe.

5. Where culvert grade or elevation are not definitely fixed by the contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe of 36".
6. Minimum Trench Width. Trenches shall be excavated to a width which will provide adequate working space and sidewall clearances for proper culvert installation, jointing, and embedment. Minimum trench widths from the bottom of the trench to an elevation 12" above the top of the installed culvert shall be as shown on the plans.
7. Mechanical Excavation. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, manual excavating methods shall be used.
8. Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated that the rough trench excavation bottom elevation can be controlled, that uniform trench widths and vertical sidewalls are obtained at least from an elevation one foot above the top of the installed culvert to the bottom of the trench, and the trench alignment is such that culvert when accurately laid to specified alignment will be centered in the trench with adequate clearance between the culvert and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.
9. Cutting Surface Construction. Cuts in asphalt and concrete pavement and base pavements shall be no larger than necessary to provide adequate working space for proper installation of culvert and appurtenances. All cuts in pavement shall saw cut the full depth of the pavement. Pavement and base pavement over trenches excavated for culvert lines shall be removed so that a shoulder not less than 6" in width at any point is left between the cut edge of the pavement and top edge of the trench. Trench width at the bottom shall not be greater than at the top and no undercutting will be permitted. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the centerline of the trench.
10. Pavement removed for connections to existing lines or structures shall not be of greater extent than necessary for the installation.
11. Where the trench parallels the length of walks and trench location is all or partially under the walk, the entire walk shall be removed and replaced. Where the trench crosses drives, walks, curbs, and other surface construction, the surface construction shall be removed and replaced between existing joints or between saw cuts as specified for pavement.
12. Excavation Below Pipe Subgrade. Except where otherwise required, pipe trenches shall be excavated below the underside of the pipe, as indicated on the drawings, to provide for the installation of pipe embedment material.
13. Artificial Foundations in Trenches. Whenever unsuitable or unstable soil conditions are encountered, trenches shall be excavated below grade and the trench bottom shall be brought to grade with additional embedment material. All timber, concrete, or other foundations made necessary by unstable soil shall be installed as indicated on the drawings or directed by the NAFI.

14. Bell Holes. Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or embedment material when the pipe is jointed.
15. Excavation to Remove Stumps, etc. If any stumps, roots logs or other hard solid masses of matter are encountered at or near the authorized subgrade within the trench area, such stumps, or other material shall be cut or removed to a further depth of 2' feet, unless otherwise authorized by the NAFI. The Contractor shall fill this excavated space with embedment material as specified herein elsewhere. No additional compensation shall be made for this work.
16. When so required by the NAFI, the Contractor shall probe 2' below the established bottom of the trench and if any stumps, roots logs, etc., are discovered by this probing, the Contractor shall cut them out just as if they had been visible in the trench.

I. Material Storage:

1. Stockpile satisfactory excavated materials in approved areas, until required for backfill or fill.
2. Place, grade and shape stockpiles for proper drainage.
3. Locate and retain soil materials away from edge of excavation.
4. Dispose of excess soil and waste materials as specified hereinafter.

- J. Unsuitable Material: Where the existing material beneath the subgrade is considered unsuitable by the NAFI, remove and replace it with select fill material.

3.05 UNAUTHORIZED EXCAVATION

- A. Limits: All excavation outside the lines and grades shown on the Drawings.
- B. Responsibility: All unauthorized excavation together with the removal and disposal of the associated materials is at the Contractor's expense.
- C. Backfill and compact the unauthorized excavation with select backfill and at the Contractor's expense.

3.06 DRAINAGE AND DEWATERING

A. General:

1. Prevent surface and subsurface water from flowing into excavations and from flooding adjacent areas.
2. Remove water from excavation as fast as it collects.
3. Maintain the ground water level below the bottom of the excavation to provide a stable surface for construction operations, a stable subgrade for the permanent work, and to prevent damage to the Work during all stages of construction.
4. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from excavations.

5. Obtain the NAFI'S approval before shutting down dewatering system for any reason.
- B. Standby Requirements for Dewatering: Provide standby equipment to ensure continuity of dewatering operations.
- C. Disposal of Water Removed by Dewatering System:
 1. Dispose of all water removed from the excavation in such a manner as not to endanger public health, property, or any portion of the Work under construction or completed.
 2. Dispose of water in such a manner as to cause no inconvenience to the NAFI, or others involved in work about the site.
 3. Convey water from the construction site in a closed conduit. Do not use trench excavations as temporary drainage ditches.

3.07 SHEETING, SHORING AND BRACING

- A. General:
 1. Excavations for Pipe Lines: Open excavation, sheeted, shored and braced where necessary to prevent injury to workmen, structures, or pipe lines.
 2. Observe all municipal, county, state and federal ordinances, codes, regulations and laws.
 3. Used material shall be in good condition, not damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary work.
 4. Design in accordance with the provisions of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", of the AISC all steel work for sheeting, shoring, bracing, cofferdams. etc. except that field welding will be permitted.
 5. Steel Sheet Piling: Interlocked steel sheet piling conforming to ASTM A 328. Furnish mill test reports on new piling but not used ones.
 6. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
 7. Unless otherwise shown, specified, or ordered, remove all materials used for temporary construction when work is completed. Make this removal in a manner not injurious to the structure or its appearance or to adjacent Work.
 8. Provide permanent steel sheet piling wherever shown on the Drawings or wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops as required and leave permanently in place.
 9. The clearances and types of the temporary structures, insofar as they affect the character of the finished Work, and the design of sheeting to be left in place, will be subject to the approval of the NAFI; but the Contractor shall be responsible for the adequacy of all sheeting, shoring, bracing, cofferdamming, and all other such structures.
 10. Safe and satisfactory sheeting shall be the entire responsibility of the Contractor.

- B. Removal of Sheeting and Bracing:
 1. Remove sheeting and bracing from excavation unless otherwise directed in writing by the NAFI.
 2. Conduct removal so as to not cause damage to the Work.
 3. Removal shall be equal on both sides of excavation to ensure no unequal loads on pipe or structure.

3.08 EXCAVATION IN THE VICINTY OF TREES

Except where trees are shown on the drawings to be removed, trees shall be protected from injury during construction operations. No tree roots over 2" in diameter shall be cut without express permission of the NAFI. Trees shall be supported during excavation as may be directed by the NAFI.

3.09 BEDDING

- A. The Contractor shall furnish and install pipe on the type of bedding shown on the Drawings or as specified. Regardless of the type of bedding used by the Contractor, holes in the trench shall be provided to receive the pipe bell. The hole excavated shall be sufficient to relieve pipe bells of all loads and yet provide support over the total length of the pipe barrel.
- B. Pipe should be installed with proper bedding providing uniform longitudinal support under the pipe. Backfill material should be worked under the sides of the pipe to provide satisfactory haunching. Initial backfill material should be placed to a minimum depth of 6" over the top of the pipe. All pipe bedding material should be selected and placed carefully, avoiding stones (over 1½ " in size), frozen lumps, and debris. Sharp stones and crushed rock (larger than ¾"), which could cause significant scratching or abrasion of the pipe, should be excluded from the embedment material. Proper compaction procedures should be exercised.

3.10 GENERAL AND SELECT BACKFILL

- A. General: Furnish, place and compact all backfill required for excavations and trenches as required to provide the finished grades shown and as described herein.
- B. Restrictions:
 1. Backfill excavations as promptly as Work permits, but not until completion of the following:
 - a. Reviewed by NAFI of construction below finish grade including dampproofing, waterproofing, and perimeter insulation, where applicable.
 - b. Inspection, testing, approval, and recording of locations of underground utilities.
 - c. Removal of concrete formwork.
 - d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

- e. Removal of trash and debris.
 - f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
- 2. Make subgrade surface level, dry, firm and subject to the NAFI'S approval.
- C. Placement:
 - 1. Keep excavation dry during backfilling operations. At no time shall water be permitted to stand in the bottom of an excavation for more than 24 hours.
 - 2. Do not place or compact backfill in a frozen condition or on top of frozen material.
 - 3. Do not place backfill material when free water is standing on the surface of the area where the backfill is to be placed.
 - 4. Bring up backfill evenly on all sides around structures and piping.
 - 5. It is intended that the elevations, lines, grades and typical sections (after settlement and compaction during construction) shall be those shown on the Drawings.
 - 6. Select Backfill shall be used in trenches under roadways and under structures unless on the plans. General Backfill shall be used for all other excavations unless otherwise noted on the plans.
- D. Rock Excavation:
 - 1. Where pipe is laid in rock excavation, provide a minimum of 4" of sand under pipes smaller than 4" and a minimum of 6" of crushed stone or gravel under piping four inches and larger.
 - 2. After laying pipe, place the balance of the backfill as described herein.
- E. Moisture:
 - 1. In general, the Contractor shall maintain the moisture content of the backfill within the range of 3 percentage points below to 2 percentage points above the optimum moisture content for compaction as determined by laboratory tests.
 - 2. The Contractor shall perform all necessary work to adjust the water content of the material to within the range necessary to permit the compaction specified.
 - 3. The Contractor shall not place backfill material when free water is standing on the surface of the area where the backfill is to be placed.
 - 4. No compaction of backfill will be permitted with free water on any portion of the backfill to be compacted.
- F. Unacceptable Material:
 - 1. Remove backfill containing organic materials or other unacceptable material and replace with approved material.
 - 2. Do not place backfill containing lumps, pockets or concentrations of silt or clay, rubble, debris, wood or other organic matter.

- G. Equipment:
 - 1. Compact backfill and fill with equipment suitable for the type of material placed and which is capable of providing the densities required.
 - 2. Select compaction equipment and submit it and proposed procedure to the NAFI for approval.
 - 3. All backfill and fill within 1' horizontally from structural walls shall be compacted to the specified density using hand-operated mechanical tampers.
- H. Coverage:
 - 1. Compact backfill and fill by at least two coverages of all portions of the surface of each lift by compaction equipment.
 - 2. One coverage is defined as the condition obtained when all portions of the surface of the backfill and material have been subjected to the direct contact of the compactor.
- I. Compaction:
 - 1. Minimum Standard Proctor Density for Select Backfill: 95% of maximum density obtained in the laboratory in accordance with ASTM D 698 Method C including Note 2. The top 12" of select backfill shall be compacted to 100% Standard Proctor.
 - 2. Minimum Standard Proctor Density for General Backfill: Compact to a density of not less than that of the surrounding soil unless otherwise noted on the plans.
 - 3. If the field and laboratory tests indicate unsatisfactory compaction, provide the additional compaction necessary to obtain the specified degree of compaction.
 - 4. Loose Lift heights shall not exceed 8" in depth and all lifts shall be compacted before the next lift is placed. Spread all lifts in a manner to provide uniform thickness after placing.
- J. Inadequate Compaction:
 - 1. If the specified densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly functioning compaction equipment, perform whatever work is required to provide the required densities.
 - 2. This work includes complete removal of unacceptable backfill areas and replacement and re-compaction until acceptable backfill is provided.
- K. Settlement:
 - 1. Repair any settlement that occurs, at Contractor's expense.
 - 2. Make all repairs and replacements necessary within 30 days after notice from the NAFI.

3.09 GENERAL AND SELECT FILL

- A. General: Furnish, place and compact all fill required to provide the finished grades shown and as described herein.

- B. Restrictions:
1. Prior to placement of fill, the existing ground shall be excavated to remove vegetation matter and then disk to provide proper bond.
 2. Removal of trash and debris.
 3. Make subgrade surface level, dry, firm and subject to the NAFI'S approval.
 4. Do not place fill material when free water is standing on the surface of the area where the backfill or fill is to be placed.
 5. Do not place fill in a frozen condition or on top of frozen material.
- C. Placement:
1. It is intended that the elevations, lines, grades and typical sections (after settlement and compaction during construction) shall be those shown on the Drawings.
 2. Select fill shall used for subgrade below all structures, buildings, roads, driveways, sidewalks, and curb and gutter.
 3. General fill shall be used as fill in all other places, unless otherwise noted on the plans.
- D. Rock Excavation
1. Where pipe is laid in rock excavation, provide a minimum of 4" of sand under pipes smaller than 4" and a minimum of 6" of crushed stone or gravel under piping 4" and larger.
 2. After laying pipe, place the balance of the backfill as described herein.
- E. Moisture:
1. In general, the Contractor shall maintain the moisture content of the backfill within the range of 3 percentage points below to 2 percentage points above the optimum moisture content for compaction as determined by laboratory tests.
 2. The Contractor shall perform all necessary work to adjust the water content of the material to within the range necessary to permit the compaction specified.
 3. The Contractor shall not place backfill material when free water is standing on the surface of the area where the backfill is to be placed.
 4. No compaction of backfill will be permitted with free water on any portion of the backfill to be compacted.
- F. Unacceptable Material:
1. Remove fill containing organic materials or other unacceptable material and replace with approved material.
 2. Do not place fill containing lumps, pockets or concentrations of silt or clay, rubble, debris, wood or other organic matter.
- G. Equipment:
1. Compact fill with equipment suitable for the type of material placed and which is capable of providing the densities required.
 2. Select compaction equipment and submit it and proposed procedure to the NAFI for approval.
 3. All fill within one foot horizontally from structural walls shall be compacted

- 4. to the specified density using hand-operated mechanical tampers. Vibratory rollers or vibratory plate compactors are suitable for compaction of structural fill.

H. Coverage:

- 1. Compact backfill and fill by at least two coverages of all portions of the surface of each lift by compaction equipment.
- 2. One coverage is defined as the condition obtained when all portions of the surface of the backfill and material have been subjected to the direct contact of the compactor.

I. Compaction:

- 1. Minimum Standard Proctor Density for Select Fill: 95% of maximum density obtained in the laboratory in accordance with ASTM D 698 Method C including Note 2. The top 12" of select backfill shall be compacted to 100% Standard Proctor.
- 2. Minimum Standard Proctor Density for General Fill: 85% of the maximum density obtained in the laboratory in accordance with ASTM D 698 Method C including Note 2 or to a density of not less than that of the surrounding soil which ever is greater.
- 3. If the field and laboratory tests indicate unsatisfactory compaction, provide the additional compaction necessary to obtain the specified degree of compaction.
- 4. Loose lifts of select fill shall not exceed 6" depth.
- 5. Loose lifts of general fill shall not exceed 9" depth.
- 6. All lifts shall be compacted before the next lift is placed. Spread all lifts in a manner to provide uniform thickness after placing.

J. Inadequate Compaction:

- 1. If the specified densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly functioning compaction equipment, perform whatever work is required to provide the required densities.
- 2. This work includes complete removal of unacceptable backfill areas and replacement and re-compaction until acceptable backfill is provided.

K. Settlement:

- 1. Repair any settlement that occurs, at Contractor's expense.
- 2. Make all repairs and replacements necessary within 30 days after notice from the NAFI.

3.10 BEDDING

A. Locations: Provide select bedding in the following locations:

- 1. Support below and around piping and foundations.
- 2. Where shown on drawings or directed by the NAFI.

B. Restrictions:

- 1. Make subgrade surface level, dry, firm and subject to the NAFI'S approval.
- 2. Do not place bedding if any water is on the surface of area to receive bedding.

3. Do not place or compact bedding in a frozen condition or on top of frozen material.
- C. Thickness of Lifts:
1. Place select bedding in horizontal loose lifts of 6" maximum thickness.
 2. Mix and spread in a manner to assure uniform lift thickness after placing.
 3. Compact each layer of bedding before placement of the next lift.
- D. Unacceptable Material:
1. Do not place bedding containing lumps, pockets or concentrations of silt or clay, rubble, debris, wood or other organic matter.
 2. Remove and dispose of bedding containing unacceptable material.
- E. Moisture:
1. In general, the Contractor shall maintain the moisture content of the backfill within the range of 3 percentage points below to 2 percentage points above the optimum moisture content for compaction as determined by laboratory tests.
 2. The Contractor shall perform all necessary work to adjust the water content of the material to within the range necessary to permit the compaction specified.
 3. The Contractor shall not place backfill material when free water is standing on the surface of the area where the backfill is to be placed.
 4. No compaction of backfill will be permitted with free water on any portion of the backfill to be compacted.
- F. Equipment:
1. Perform compaction of bedding with equipment suitable for the type of bedding material being placed.
 2. Select equipment which is capable of providing the densities required and submit the equipment to the NAFI for review.
 3. Vibratory rollers or vibratory plate compactors are suitable for compaction of structural bedding.
 4. All bedding within one foot horizontally from structural walls shall be compacted to the specified density using hand-operated mechanical tampers.
- G. Coverage:
1. Compact each layer of bedding material by at least two complete coverages of all portions of the surface of each lift using suitable compaction equipment.
 2. One coverage is defined as the condition reached when all portions of the bedding lift have been subjected to the direct contact of the compacting surface of the compactor.
- H. Compaction:
1. Minimum Standard Proctor Density for Select Bedding: 95% of the maximum density obtained in the laboratory in accordance with ASTM D 698 Method C including Note 2.
 2. If the field and laboratory tests indicate unsatisfactory compaction, provide the additional compaction necessary to obtain the specified

degree of compaction.

- I. Inadequate Compaction:
 - 1. If the specified densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly functioning compaction equipment, perform whatever work is required to provide the required densities.
 - 2. This work includes complete removal of unacceptable bedding areas and replacement and re-compaction until acceptable bedding is provided.
- J. Settlement:
 - 1. Repair any settlement that occurs, at Contractor's expense.
 - 2. Make all repairs and replacement necessary within 30 days after notice from the NAFI.

3.11 GRADING

- A. General:
 - 1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas.
 - 2. Smooth subgrade surfaces within specified tolerances.
 - 3. Compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.
- C. Limits: Maximum vertical deviation from grades shown on plans.
 - 1. Under pavements, structures, and foundations $\pm 1/4"$
 - 2. General grading areas $\pm 2"$
 - 3. No vertical deviation will be accepted that ponds water.

3.12 DISPOSAL OF EXCAVATED MATERIALS

Excess or Unsuitable Material:

- A. Haul away from the project site all material removed from the excavations which does not conform to the requirements for fill or backfill or is in excess of that required for backfill.
- B. Dispose of excess or unsuitable material in compliance with municipal, county, state, federal or other applicable regulations at no additional cost to the NAFI.

3.13 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction:
 - 1. Testing lab will inspect and approve subgrades and fill layers before further construction work is performed thereon.

2. Tests of subgrades, backfill and fill layers shall be taken as follows:
 - a. Fill and Backfill: One field density for every 5,000 square feet of material installed in open areas for each of the last four layers of material placed.
 - b. Pipeline Installation, Roadway and Driveway Crossings: Two field densities for each crossing. Placement of test will be as directed by NAFI.
 - c. Pipeline Installation, Running in Roadways: Two field densities at different depths for every 200' of pipe installed. Depth placement will be as determined by NAFI.
 - d. Under Pavement/Roadways: 3 test per 100 linear feet of Road/Pavement. Test centerline and back of curbs at each location. Test top 4 layers of material installed.
- B. Unsuitable Compaction: If, based on reports of testing lab and inspection, subgrade, backfills or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense to the NAFI.

END OF SECTION 02200

SECTION 02221 – CRUSHED STONE AND GRAVEL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. Contractor shall furnish and place crushed stone, gravel, and clay gravel of the types specified at locations shown and as ordered by the NAFI.
 - 2. Work includes providing a gravel surface on a prepared subgrade as required for roadways and driveways.
- B. Related Work Specified Elsewhere: Section 02200, Earthwork, Excavation, and Backfill

1.02 SUBMITTALS

Contractor shall furnish representative samples of the crushed stone or gravel to the NAFI and shall advise of the source location.

1.03 QUALITY ASSURANCE

Tests:

- A. Source Quality Control: Contractor shall be responsible for payment for all testing required to determine acceptability of crushed stone and gravel at the locations where the material is obtained.
- B. Field Quality Control Testing: The Contractor shall retain the services of a qualified testing laboratory to make tests and determine acceptability of the crushed stone and gravel upon delivery to the job site.
- C. Contractor shall give full cooperation to the testing lab personnel so that the required tests can be taken in an efficient and timely manner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Crushed Stone or Screened Gravel for Foundations:
 - 1. Place below slabs or foundations a minimum thickness of 6" for drainage course.
 - 2. Material: Gradation Size Number 67 as specified in ASTM C33.
 - 3. Contractor shall submit samples meeting the above requirements to an approved commercial testing laboratory for sieve analysis. The laboratory analysis results shall be approved by the NAFI before any material is ordered.
 - 4. After the materials are delivered to the job site, the Engineer or Testing Lab will take two samples from each shipment of material. The Contractor shall have a sieve analysis performed on these samples by the Contractor's testing laboratory. If the results of the samples taken in the field do not

conform to those previously approved, the material will be rejected and shall be modified or removed from the job site.

- B. Clay Gravel: (Temporary Drive Repair)
1. Clay Gravel Surface Course: Mississippi Department of Transportation (MDOT) Standard Specifications. Clay gravel shall be Class 5, Group C as outlined in Section 703.07 of the MDOT specifications.
 2. Clay Gravel Base Course: MDOT Standard Specification. Clay gravel base course shall be Class 9, Group C as outlined in Section 703.07 of the MDOT specifications.
- C. Crushed Limestone Material:
1. Crushed limestone material used in this work shall meet the following requirements:

<u>Sieve Size</u>	<u>Percent Passing</u>
1"	100
¾"	90-100
3/8"	25-55
No. 4	0-10
No. 8	0-5

2. Locations:
 - a. Roadway Subbase
 - b. Crushed Stone Access Drive
 - c. Crushed Stone Finished Surfaces

- D. Filter Fabric:
1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:
 - a. Grab Tensile Strength (ASTM D4632): 100 lb.
 - b. Apparent Opening Size (ASTM D4751): #100 U.S. Standard sieve
 - c. Permeability (ASTM D4491): 150 gallons per minute per square foot.

PART 3 - EXECUTION

3.01 CRUSHED STONE, GRAVEL, AND CLAY GRAVEL

- A. General:
1. Place material, in layers of specified thickness, over ground surface where indicated on Contract Drawings.
 2. Comply with *Mississippi Department of Transportation Standard Specification for Road and Bridge Construction*, latest edition.

3. Filter Fabric shall be installed where noted in the documents between granular courses and compacted subgrade to filter soil from aggregate layers.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope.
- C. Placing:
1. Place material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness.
 2. Maintain optimum moisture content for compacting clay gravel material during placement operations.
 3. When a compacted course is shown to be 6" thick or less, place material in a single layer.
 4. When a compacted course is shown to be more than six inches thick, place material in equal layers, except no single layer shall be more than 6" or less than 3" in thickness when compacted.
- D. Compaction:
1. The minimum density for clay gravel and aggregates shall be 98% of the maximum density obtained in the laboratory.
 2. If the field and laboratory tests indicate unsatisfactory compaction, the Contractor shall provide the additional compaction necessary to obtain the specified degree of compaction.

3.02 INSPECTION

Examine the subgrade on which the aggregate shall be installed and notify the NAFI in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the NAFI.

END OF SECTION 02221

SECTION 02230 SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the RFP and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 1. Protecting existing trees and vegetation to remain.
 2. Removing trees and other vegetation.
 3. Clearing and grubbing.
 4. Topsoil stripping.
 5. Removing above-grade site improvements.
 6. Disconnecting, capping or sealing, and abandoning site utilities in place.
 7. Disconnecting, capping or sealing, and removing site utilities.
- B. Related Sections include the following:
 1. Division 1 Section "Field Engineering" for verifying utility locations and for recording field measurements.
 2. Division 1 Section "Construction Facilities and Temporary Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
 3. Division 2 Section "Selective Demolition" for partial demolition of buildings or structures undergoing alterations.
 4. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain NAFI's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings according to Section H-16.
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions. Coordinate with the Public Works Department.

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from NAFI and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 3. Reference Section H-5 Scheduled Outages.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on NAFI's premises where indicated.
- C. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."
 - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to NAFI.

3.2 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
 - 1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 - 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with burlap and water regularly.
 - 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 - 3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by NAFI.
 - 1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
 - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

- A. Contractor will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing. Notify NAFI 48 hours in advance.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange to shut off indicated utilities with utility companies.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by NAFI or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify NAFI not less than two days in advance of proposed utility interruptions.

- 2. Do not proceed with utility interruptions without NAFI's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.
- E. Removal of underground utilities is included in Division 15 mechanical or Division 16 electrical Sections.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
 - 4. Use only hand methods for grubbing within drip line of remaining trees.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
 - 2. Do not stockpile topsoil within drip line of remaining trees.
 - 3. Dispose of excess topsoil as specified for waste material disposal.
- D. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- E. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.6 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off NAFI's property.

END OF SECTION 02230

SECTION 02270 – SLOPE PROTECTION & EROSION CONTROL

PART 1 — GENERAL

1.01 SECTION INCLUDES

- A. Installation of temporary erosion and sediment control items prior to clearing or demolition and commencing earthwork.
- B. Stabilization of denuded areas
- C. Protection and stabilization of soil stockpiles
- D. Installation of sediment basin and traps, silt barrier fences, and sediment basin risers
- E. Temporary seeding, mulching, and sodding
- F. Excavation and embankment construction activities
- G. Stabilization of construction entrances
- H. Maintenance and removal of all sediment and erosion control measures
- I. Permanent erosion control systems
- J. Slope protection systems

1.02 RELATED SECTIONS

- A. Section 02230 — Site Clearing
- B. Section 02200 – Excavation, and Backfill
- C. Section 02221 — Crushed Stone and Gravel

1.03 ENVIRONMENTAL REQUIREMENTS

The Contractor shall protect adjacent properties and water resources from erosion and sediment damage throughout the life of the contract.

1.04 REGULATORY REQUIREMENTS

- A. Comply with all applicable codes and with the requirements of agencies having jurisdiction over the work in this Section.
- B. If the NAFI does not already have, Contractor shall bear the responsibility of obtaining the applicable storm water permits from the Mississippi Department of Environmental Quality.

1.05 SUBMITTALS

Submit all products according to Division 01 of the specifications.

1.06 EXAMINATION

Visually determine that the project is ready for the work of this section; beginning work shall indicate acceptance of the conditions.

PART 2 — PRODUCTS

2.01 Erosion and sediment control materials suitable for site conditions shall be in accordance with Section J-2, Temporary Environmental Controls requirements, as well as those imposed by the Mississippi Department of Transportation *Standard Specifications for Road and Bridge Construction*, latest edition, Sections 234, 235 and 236.

2.02 MATERIALS

- A. Erosion Control Blankets (Ditch Liner):
 - 1. Short-term, degradable erosion control protection with anchor/pins.
 - 2. Mass/Unit Area (ASTM D6475): 8 oz/square yard
 - 3. Tensile Strength (ASTM D6818): 50 lb/ft
 - 4. Roll Area: 100 square yards.
 - 5. Pins: 2 per square yard minimum or per manufacturer's recommendations for installation.
 - 6. Manufacturer: LandLok S1 by Propex or equal.
- B. Turf Reinforcement Mat (TRM):
 - 1. Permanent erosion control protection with pins.
 - 2. Mass/Unit Area (ASTM D6566): 8 oz/square yard
 - 3. Tensile Strength (ASTM D6818): 2000 lb/ft
 - 4. UV Resistance (ASTM D4355): 90% at 3000 hours
 - 5. Roll Area: 100 square yards
 - 6. Pins: 2 per square yard minimum, 12" length or per manufacturer's recommendations for installation.
 - 7. Manufacturer: LandLok 300 by Propex or equal.
- C. High-Performance Turf Reinforcement Mat (HPTRM):
 - 1. Permanent erosion control protection with pins
 - 2. Mass/Unit Area (ASTM D6566): 13.5 oz/square yard
 - 3. Tensile Strength (ASTM D6818): 3000 lb/ft
 - 4. UV Resistance (ASTM D4355): 90% at 6000 hours
 - 5. Pins: see TRM
 - 6. Manufacturer: Pyramat by Propex or equal.
- D. Anchored Turf Reinforcement Mat (ATRM):
 - 1. Purpose: Permanent device to secure mat to ground
 - 2. Material: Stainless Steel and/or Aluminum (Corrosion Resistant)
 - 3. Type: Earth Percussion, Permanent

4. Pull Out Strength: 500 lbs
 5. Length: 3 ft.
 6. Mat: Shall be high-performance turf reinforcement mat
- E. Mulch: Use one of the following:
1. Wheat or Oat Straw.
 2. Wood chips, or bark – produced from on-site grinding of the trees to be cleared and/or off-site supply.
 3. Hydromulch.
 4. Polyethylene film – 6 mil. black
- F. Grass Seed for Temporary Cover: See grass schedule “Seeding Chart” in Mississippi Storm Water Pollution Prevention Plan (SWPPP), Guidance Manual, for Construction Activities. Also reference Section J-2, Temporary Environmental Controls.
- G. Bales: Air dry, rectangular straw bales.
1. Cross Section: 14” by 18”, minimum
 2. Bindings: Wire or string, around long dimension
- H. Bale Stakes: One of the following, minimum 3 ft. long
1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
 2. Wood, 2” x 2” in cross section
- I. Silt Fence Fabric: Geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 2. Water Flow Rate: 0.3 gal./Sq.Ft./min., minimum, when tested in accordance with ASTM D 4491.
 3. Ultraviolet Resistance: Retaining at least 70% of tensile strength, when tested in accordance with ASTM D4355 after 500 hours exposure.
 4. Tensile Strength: 100 lb-ft, minimum, in cross-machine direction; 124 lb-ft, minimum, in machine direction; when tested in accordance with ASTM D4632.
 5. Elongation: 20%, when tested in accordance with ASTM D4632.
 6. Tear Strength: 55 lb-ft, minimum, when tested in accordance with ASTM D4533.
- J. Silt Fence Posts: One of the following, minimum 5 ft. long:
1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot
 2. Hardwood, 2” x 2” in cross section

PART 3 — EXECUTION

3.01 PREPARATION

Deficiencies or changes in the erosion control plan as it is applied to current conditions will be brought to the attention of the NAFI for remedial action.

3.02 EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

- A. Erosion and Sedimentation control best management practices are required during all ground disturbing activity until permanent measures have been installed.
- B. In all cases, if permanent erosion resistant measures have been installed, temporary preventive measures are not required.
- C. All preventive measures shall comply with the BMPs as indicated in *Mississippi Storm Water Pollution Prevention Plan (SWPPP), Guidance Manual, for Construction Activities*, latest edition.
- D. Construction Entrances: Shall be required at sites where dirt and mud can be tracked on to public roads. Entrance shall be a minimum diameter of 3" and a maximum diameter of 6". Entrance shall be a minimum of 12" thick with a layer of filter fabric beneath the Aggregate. Contractor shall periodically top dress with additional stone.
- E. Linear Sediment Barriers: Made of silt fences; straw bales; rock; and Earth berms during clearing operations only.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles
 - b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas
 - c. Along the toe of cut slopes and fill slopes
 - d. Perpendicular Check Dams to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas
 - e. Across the entrances to culverts that receive runoff from disturbed areas
 - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2%: 100'
 - b. Slope Between 2% – 5%: 75'
 - c. Slope Between 5% – 10%: 50'
 - d. Slope Between 10% – 20%: 25'
 - e. Slope Over 20%: 15'
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Mulching: Use only for areas that may be subjected to erosion for less than 6 months. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- H. Temporary Seeding: Temporary Seeding shall be installed on disturbed ground in which no further construction activity is scheduled to commence within thirty (30) calendar days due to weather or scheduling. Temporary Seeding shall be installed within ten (10) calendar days of work being stopped or completed in the area. Use where temporary vegetated cover is required on plans or as required by *Mississippi SWPPP, Guidance Manual*.

3.03 INSTALLATION

- A. Installation of Erosion Control Measures shall be in accordance with the requirements of Mississippi *Standard Specifications for Road and Bridge Construction*, latest edition, Sections 234, 235 and 236 and *Mississippi Storm Water Pollution Prevention Plan (SWPPP), Guidance Manual, for Construction Activities*, Latest Edition.
- B. Turf Reinforcement Mats: Turf Reinforcement mat shall be installed per manufacturer's recommendations.
- C. Silt Fences:
 - 1. Store and handle fabric in accordance with ASTM D4873.
 - 2. Where slope gradient is less than or equal to 3:1 or barriers will be in place less than 6 months, use nominal 16" high barriers with minimum 60" long posts spaced at 6 feet maximum, with fabric embedded at least 4" in ground. Install post starting at the center of the lowest point of the fence line to a minimum depth of 12" into ground.
 - 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 20" high barriers, minimum 60" long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground. Install post starting at the center of the lowest point of the fence line to a minimum depth of 12" into ground.
 - 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20', use nominal 24" high barriers with woven wire reinforcement and steel posts spaced at 4' feet maximum, with fabric embedded at least 6 inches in ground. Install post starting at the center of the lowest point of the fence line to a minimum depth of 12" into ground.
 - 5. Install with top of fabric at nominal height and embedment as specified.
 - 6. Embed bottom of fabric in a trench on the upslope side of fence, with 4", minimum of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
 - 7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 6", with extra post.
 - 8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
 - 9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 16" high with post spacing not more than 4'.
 - 10. Optional: silt fence installation with vibratory plow may be permitted under certain conditions. Submit written installation specifications to NAFI for approval.
- D. Straw Bale Rows:
 - 1. Do not use in areas with slopes greater than 2%.
 - 2. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
 - 3. Install bales so that bindings are not in contact with the ground.
 - 4. Embed bales at least 4" in the ground.
 - 5. Anchor bales with at least two stakes per bale, driven at least 12" inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
 - 6. Tightly wedge loose straw into gaps between ends of bales.

7. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- E. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2 tons per acre; anchor using dull disc harrow or mulch tiller.
 2. Wood Waste: Apply 6 tons per acre.
 3. Erosion Control Matting: Submit product cut sheets for approval. Comply with product manufacturer's instructions.
 4. Hydromulch: Submit written installation specifications for approval. Comply with product manufacturer's instructions.
- F. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4" depth.
 2. Wood Waste: Apply 3" depth.
 3. Pine Needles: Apply 3" depth.
 4. Erosion Control Matting: Submit product cut sheets for approval. Comply with product manufacturer's instructions.
 5. Hydromulch: Submit written installation specifications for approval. Comply with product manufacturer's instructions.
- G. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 5 pounds per 1000 sq ft.
 4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 10 pounds per 1000 sq ft.
 5. Incorporate fertilizer into soil before seeding.
 6. Broadcast seed by approved sowing equipment. Sow one half of the seed in one direction, and the remainder sown at right angles to the first sowing. Cover seed uniformly using spiked toothed harrow, cultipacker-type seeder or other approved device to an average depth of 1/40.
 7. Immediately after seeding, firm up the entire area with a roller not exceeding 150 pounds per foot of roller width. Where seeding is performed with a cultipacker-type seeder or where seed is applied in combination with hydro-mulching, no rolling is required.
 8. Immediately after preparing the seeded area, evenly spread an organic mulch of straw by hand or by approved mechanical blowers. See mulching installation above.
 9. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
 10. Repeat irrigation as required until grass is established.
- H. Erosion Control Blanket:
1. Install and maintain erosion control material meeting the requirements of this specification on the designated areas as shown and specified. Prepare, fertilize and vegetate the area(s) to be covered, as specified, before the erosion material is placed. Immediately following the planting operations, lay the material evenly

- and smoothly and in contact with the soil throughout. Omit the straw mulch from all seeded areas receiving the erosion control material.
2. For waterways, unroll the material in the direction of water flow. When two or more strips are required to cover a ditch area, they shall overlap at least 4". In case a strip is to be spliced lengthwise, the ends of the strips shall overlap at least 6" with the upgrade section on top.
 3. When using erosion control material on slopes, place the material either horizontally or vertically to the slope with the edges and ends of adjacent strips butted tightly against each other.
 4. Staple each strip in three rows (each edge and center with the center row alternately spaced) with staples spaced not more than 4 feet longitudinally. When using two or more strips side by side on slopes, use a common row of staples on the adjoining strips. Staple all end strips at 12" intervals at the end. Firmly embed staples in the underlying soil.
 5. Install and maintain material until vegetation is established on all slopes 3:1 and steeper or on any slope where erosion prohibits the establishment of vegetation.

3.04 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed 1/3 of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 2. Remove silt deposits that exceed one-half of the height of the bales.
 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

3.05 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.

- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION 02270

SECTION 02300 EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for concrete walks and pavements.
 - 5. Excavating and backfilling trenches within building lines.
 - 6. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
 - 1. Division 1 Section "Construction Facilities and Temporary Controls."
 - 2. Division 2 Section "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
 - 3. Division 3 Section "Cast-in-Place Concrete" for granular course over vapor retarder.
 - 4. Division 15 and 16 Sections for excavating and backfilling buried mechanical and electrical utilities and buried utility structures.

1.3 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Layer placed between the subbase course and asphalt paving.
- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by NAFI. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by NAFI. Unauthorized excavation, as well as remedial work directed by NAFI, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm).

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

L. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Samples: For the following:

1. Samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.
3. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.

C. Tests:

1. The CONTRACTOR shall retain the services of a qualified testing laboratory to make tests and determine acceptability of the fill or material as listed below.
2. Contractor shall give full cooperation to the testing lab personnel so that the required soil tests can be taken in an efficient and timely manner.

3. Required Tests:
 - a. Approval of Select Fill Samples:
 - 1.) Gradation, ASTM D 422.
 - 2.) Liquid Limit, Plastic Limit and Plasticity Index, ASTM D 4318.
 - 3.) Compaction, Laboratory Moisture-Density Relationship Standard Effort ASTM D 698.
4. Compacted Select Fill:
 - a. Compaction, Field Density; ASTM D 2922.
 - b. Compaction, Moisture Content, ASTM 3017

1.5 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by NAFI or others unless permitted in writing by NAFI and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify NAFI not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without NAFI's written permission.
 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- C. No extra compensation shall be granted for work which the Contractor should have foreseen by close conscientious investigation of the site. Unforeseen conditions discovered after conscientious investigations shall be immediately brought to the attention of the NAFI as per the General Conditions as supplemented.
- D. Permits and Regulations:
 1. Obtain all necessary permits for work in roads, rights-of-way, railroads, etc.
 2. Obtain permits as required by local, state and federal agencies for discharging water from excavations to rivers and streams.
 3. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, SW, CL, SP, SM, GC SC, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups ML, MH, CH, OL, OH, PT, GM or a combination of these group symbols.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Non-Select (General) Fill Material:
 - 1. Shall be used in non-building areas and shall not be utilized beneath buildings or pavements.
 - 2. Can be obtained from on-site grading or excavation operations or imported from off-site.
 - 3. Shall be free of organics, vegetation, debris, large boulders, large pieces of chalk, or other deleterious materials.
 - 4. Shall have the following physical properties:

Liquid Limit:	50 or less
Plasticity Index	35 or less
 - 5. Non-Select fill material is subject to the approval of the NAFI.
- F. Select Fill Material:
 - 1. Shall consist of a silty clay, sandy clay or clayey sand soil that is free of roots, construction debris, organic matter, or any other type deleterious matter.
 - 2. Shall have the following physical properties:

Liquid Limit:	45 or less
Plasticity Index:	Between 5 and 25
- G. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- H. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (38-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- I. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

2.2 ACCESSORIES

- A. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
 - 2. Tear Strength: 40 lbf (178 N); ASTM D 4533.
 - 3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
 - 4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
 - 5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.
- B. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
 - 2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
 - 3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
 - 4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
 - 5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Excavation: Excavation to subgrade elevations required.
 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 1. Clearance: 12 inches (300 mm) on each side of pipe or conduit.
 2. Clearance: As indicated.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells,

joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 APPROVAL OF SUBGRADE

- A. Notify NAFI when excavations have reached required subgrade.
- B. If NAFI and testing lab determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for record documents.
 3. Inspecting and testing underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.

3.11 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.
- C. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- D. Coordinate backfilling with utilities testing.
- E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.
- F. Place and compact final backfill of satisfactory soil material to final subgrade.
- G. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.12 SELECT FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify and bench sloped surfaces steeper than 1 vertical to 6 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use select fill material.
 - 3. Under steps and ramps, use select fill.
 - 4. Under building slabs, use select fill.
 - 5. Under footings and foundations, use select fill.

3.13 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 98 percent.
 - 2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 95 percent.
 - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 90 percent.

3.15 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
 - 2. Walks: Plus or minus 1 inch (25 mm).
 - 3. Pavements: Plus or minus 1/2 inch (13 mm).
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.16 SUBBASE AND BASE COURSES

- A. Install separation fabric on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

3.17 DRAINAGE COURSE

- A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
 - 1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
 - 2. When compacted thickness of drainage course is 6 inches (150 mm) or less, place materials in a single layer.

3. When compacted thickness of drainage course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

3.18 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing. NAFI shall approve testing firm.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by NAFI.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet (30 m) or less of wall length, but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 1. Scarify or remove and replace soil material to depth as directed by NAFI; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off NAFI's property.

END OF SECTION 02300

SECTION 02361 TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following for termite control:
 - 1. Soil treatment.
 - 2. Below slab and all foundation systems.

1.3 DEFINITIONS

- A. EPA: Environmental Protection Agency.
- B. PCO: Pest control operator.

1.4 SUBMITTALS

- A. Product Data: Treatments and application instructions, including EPA-Registered Label.
- B. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of NAFI and other information specified.
- D. Soil Treatment Application Report: After application of termiticide is completed, submit report for NAFI's record information, including the following as applicable:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.
- E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. **Applicator Qualifications:** A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.
- B. **Regulatory Requirements:** Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. **Environmental Limitations:** To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.7 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.
- B. Install bait station system after construction, including landscaping, is completed.

1.8 WARRANTY

- A. **General Warranty:** Special warranty specified in this Article shall not deprive NAFI of other rights NAFI may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. **Special Warranty:** Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
- C. **Warranty Period:** Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. **Termiticide:** Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label. **Provide integral colored dye in mix to allow visual inspection.**

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AgrEvo Environmental Health, Inc.; a Company of Hoechst and Schering, Berlin.
 2. American Cyanamid Co.; Agricultural Products Group; Specialty Products Department.
 3. Bayer Corp.; Garden & Professional Care.
 4. DowElanco.
 5. FMC Corp.; Pest Control Specialties.
 6. Zeneca Professional Products.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.
- C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 3. Crawlspace: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
 4. Masonry: Treat voids.
 5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 02361

SECTION 02751 CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Walkways.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
 - 2. Division 2 Section "Pavement Joint Sealants" for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.
 - 3. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or adhesive.
 - 8. Joint fillers.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
- E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- C. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars; assembled with clips.
- E. Plain Steel Wire: ASTM A 82, as drawn.
- F. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

- G. Tie Bars: ASTM A 615/A 615M, **Grade 60** (**Grade 420**), deformed.
- H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer coated wire bar supports.
- I. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

2.3 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, Type I or II.
- C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
 - 1. Class: 4M.
 - 2. Maximum Aggregate Size: **1-1/2 inches** (**38 mm**) nominal.
 - 3. Do not use fine or coarse aggregates containing substances that cause spalling.
- D. Water: ASTM C 94.

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Any admixture must be approved for use by NAFI.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately **9 oz./sq. yd.** (**305 g/sq. m**) dry.

- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Evaporation Retarder:
 - a. Cimfilm; Axim Concrete Technologies.
 - b. Finishing Aid Concentrate; Burke Group, LLC (The).
 - c. Spray-Film; ChemMasters.
 - d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
 - e. Sure Film; Dayton Superior Corporation.
 - f. Eucobar; Euclid Chemical Co.
 - g. Vapor Aid; Kaufman Products, Inc.
 - h. Lambco Skin; Lambert Corporation.
 - i. E-Con; L&M Construction Chemicals, Inc.
 - j. Confilm; Master Builders, Inc.
 - k. Waterhold; Metalcrete Industries.
 - l. Rich Film; Richmond Screw Anchor Co.
 - m. SikaFilm; Sika Corporation.
 - n. Finishing Aid; Symons Corporation.
 - o. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.
 - 2. Clear Waterborne Membrane-Forming Curing Compound:
 - a. AH Curing Compound #2 DR WB; Anti-Hydro International, Inc.
 - b. Aqua Resin Cure; Burke Group, LLC (The).
 - c. Safe-Cure Clear; ChemMasters.
 - d. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
 - e. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.
 - f. Nitocure S; Fosroc.
 - g. Aqua Kure-Clear; Lambert Corporation.
 - h. L&M Cure R; L&M Construction Chemicals, Inc.
 - i. 1100 Clear; W. R. Meadows, Inc.
 - j. Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
 - k. Rich Cure E; Richmond Screw Anchor Co.
 - l. Resi-Chem Clear Cure; Symons Corporation.
 - m. Horncure 100; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
 - n. Hydro Cure; Unitex.
 - o. Certi-Vex Enviocure; Vexcon Chemicals, Inc.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D5893 for Type SL:
 - 1. Type SL Silicone Sealant for Concrete and Asphalt:
 - a) 890-SL; Dow Corning.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.7 CONCRETE MIXES

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
 - 1. Do not use NAFI's field quality-control testing agency as the independent testing agency.
- C. Proportion mixes to provide concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 3 inches (75 mm).
- D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.
- E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2.5 to 4.5 percent.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:
 - 1. Air Content: 5.5 percent for 1-1/2-inch (38-mm) maximum aggregate.
 - 2. Air Content: 6.0 percent for 1-inch (25-mm) maximum aggregate.
 - 3. Air Content: 6.0 percent for 3/4-inch (19-mm) maximum aggregate.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap to adjacent mats.

3.4 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 - 1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least **1-1/2 inches (38 mm)** into concrete.
 - 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 3. Provide tie bars at sides of pavement strips where indicated.
 - 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of **50 feet (15.25 m)**, unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler less than **1/2 inch (12 mm)** or more than **1 inch (25 mm)** below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas not exceeding 12' x 12' sections. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: **1/4 inch (6 mm)**.

2. Sawed Joints: Form contraction joints with power saws equipped with shatter-proof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
1. Radius: 1/4 inch (6 mm).

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at Project site, or during placement.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- I. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Pro-

duce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- J. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- K. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- L. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
- ### 3.6 CONCRETE FINISHING
- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching **0.2 lb/sq. ft. x h (1 kg/sq. m x h)** before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with **12-inch (300-mm)** lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least **12 inches (300 mm)**, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: **1/4 inch (6 mm)**.
 - 2. Thickness: Plus **3/8 inch (9 mm)**, minus **1/4 inch (6 mm)**.
 - 3. Surface: Gap below **10-foot- (3-m-)** long, unlevelled straightedge not to exceed **1/4 inch (6 mm)**.
 - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: **1 inch (25 mm)**.
 - 5. Vertical Alignment of Tie Bars and Dowels: **1/4 inch (6 mm)**.
 - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: **1/2 inch (13 mm)**.
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel **1/4 inch per 12 inches (6 mm per 300 mm)**.

8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing shall be performed according to the following requirements:
 1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m). One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
 7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 8. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), NAFI may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
 10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).
- C. Test results shall be reported in writing to NAFI, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design com-

pressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by NAFI but will not be used as the sole basis for approval or rejection.
- E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by NAFI. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by NAFI when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 02751

SECTION 02930 – VEGETATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. Contractor shall furnish all labor, materials and incidentals required to provide vegetation as specified.
 - 2. The extent of the vegetation work shall be at all disturbed areas.
- B. Coordination: Review installation procedures under other sections and coordinate the installations of items that must be installed with the grass.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02230 — Site Clearing
- B. Section 02270 — Slope Protection and Erosion Control

1.03 QUALITY ASSURANCE

- A. Source Quality Control: The Contractor shall:
 - 1. General: Ship grass materials with certificates of inspection as required by governmental authorities. Comply with governing regulations of the State of Mississippi and U.S. Department of Agriculture, Circular No. 156 applicable to grass materials.
 - 2. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Analytical Chemists, wherever applicable or as further specified.
- B. Reference Standards: The Contractor shall comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:
 - 1. Association of Official Analytical Chemists, Official Methods of Analysis
 - 2. American Joint Committee on Horticultural Nomenclature, Standardized Plant Names
 - 3. ASTM C602, Agricultural Liming Materials
 - 4. ASTM D2487, Classification of Soils for engineering Purposes
 - 5. FSO-F-241D, Fertilizer, Mixed, Commercial
 - 6. FSO-P-166E, Peat Moss; Peat, Humus; and Peat. Reed-sedge
 - 7. Official Seed Analysts of North America, Standards of Quality

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Seed:
 - 1. Delivery: Furnish standard seed in unopened manufacturer's standard containers bearing quantity, analysis and name of manufacturer.
 - 2. Storage: Store seed with protection from weather or other conditions, which would damage or impair the effectiveness of the product.

- B. Sod:
 - 1. Harvest and Delivery: Harvest from the source and deliver to project site within 24 hours. Deliver only as much sod as can be installed in one day's work.
 - 2. Review: Sod not transplanted within this time period shall be reviewed prior to installation.
- C. Mulch:
 - 1. Labeling: Each package of the cellulose fiber shall be marked by the manufacturer to show the air dry weight content.
 - 2. Storage: Store seed with protection from weather or other conditions, which would damage or impair the effectiveness of the product.

1.05 JOB CONDITIONS

- A. By submitting a bid the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.
- B. Plans, specifications, surveys, measurements, other documents and dimensions under which the work is to be performed are believed to be correct; but the Contractor shall have examined them for himself during the Bidding period, as no additional compensation will be made for errors or inaccuracies that may be found therein.
- C. Environmental Requirements: The Contractor shall:
 - 1. Proceed with and complete the grass work as rapidly as portions of the site become available, working within the seasonal limitations for each type of grass required.
 - 2. Not spread seed when wind velocity exceeds 5 miles per hour.
- D. Scheduling: The Contractor shall plant or install materials only during normal planting seasons. He shall correlate planting with specified maintenance periods to provide maintenance until project is complete.

1.06 ALTERNATIVES

The Contractor shall not make substitutions. If specified grass material is not obtainable, submit to NAFI proof of non-availability and proposal for use of equivalent material.

1.07 GUARANTEE

The Contractor shall guarantee grass through the specified maintenance period, and until final acceptance of the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Grass Materials(Seed):

1. Grass Seed Mixture: The Contractor shall provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by the Official Seed Analysts of North America. He shall provide seed of the grass species, proportions, and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.
2. The "Schedule of Grass Seed Requirements" is as follows:

Name of Grass	Purity	Germination	Application Per Acre	
			March 1 to Sept. 15	Sept. 15 to March 1
Common Bermuda Grass	95%	90%	30 lbs (hulled)	30 lbs
Rye	95%	90%	-	15 lbs
Kentucky Fescue	95%	80%	10 lbs	-
Crimson Clover	98%	85%	20 lbs	10 lbs
White Clover	95%	90%	5 lbs	10 lbs

B. Grass Materials (Sod):

Bermuda (Cynodon Dactylon) Sod: Nursery grown, certified, approved sod furnished in supplier's standard size square or rectangular pads, ½" in. thickness (+1/4" -), excluding growth and thatch.

1. Mowing Height: 3/4" maximum
2. Thatch: ½" uncompressed
3. Inspected and free of diseases, nematodes, pests and pest larvae by an entomologist of the State Department of Agriculture.
4. Free of common Bermuda grass, quack grass, Johnson grass, poison ivy, nutsedge, nimblewill, Canadian thistle, bindweed, bent grass, wild garlic, ground ivy, perennial sorrel and broom grass.
5. Having not more than five jimsonweed, mustard, lambs' quarter, chickweed, cress or crabgrass per 100 sq. ft.

C. Fertilizers:

1. Commercial Fertilizer: Complete fertilizer of neutral character, with a minimum of 75% nitrogen derived from natural organic sources or urea form; 40-50% of the nitrogen shall be water soluble. Available phosphoric acid derived from superphosphate, bone, or tankage. Potash derived from

muriate of potash, containing 60% potash. Uniform in composition, free flowing, and suitable for application with approved equipment.

2. Provide the following types of fertilizers:
 - a. Combination Fertilizer: Minimum chemical analysis of nitrogen, phosphorus and potash of 8-24-24.
 - b. Manufactured Fertilizer: Ammonium nitrate having a minimum chemical analysis of nitrogen, phosphorus and potash of 33-0-0.
- D. Mulch: per specification 2270.
- E. Water: Potable
- F. Provide Erosion Control Blanket per specification 02270 for slope stabilization and promote establishment of vegetation.

PART 3 - EXECUTION

3.01 INSPECTION

Contractor and his installer shall examine the topsoil, verify the elevations, and depth of topsoil, observe the conditions under which work is to be performed, and notify the NAFI of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to NAFI.

3.02 SOIL PREPARATION

The Contractor shall:

- A. Apply combination fertilizer (8-24-24) by machine; over areas to receive grass at a rate of 350 pounds per acre.
- B. Apply commercial fertilizers within 10 days of planting.
- C. Thoroughly and evenly incorporate combination fertilizer (8-24-24) with the soil to depth of 3" by disking, or other approved method.
 1. In areas inaccessible to power equipment, use hand tools.
 2. Adjacent to existing trees, adjust depth to avoid disturbing roots.
- D. Grade planting areas to smooth, even surface with loose, uniformly fine texture. Remove all stones and extraneous foreign material in excess of 1" diameter. Roll and rake and remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.
- E. Moisten prepared planting areas before seeding if soil is dry. Water thoroughly and allow surface moisture to dry before planting. Do not create a muddy soil condition.
- F. Restore planting areas to specified condition if eroded or otherwise disturbed after fine grading and prior to seeding.

3.03 INSTALLATION

- A. General: The Contractor shall maintain grade stakes until removal is mutually agreed upon by all parties concerned.
- B. Seeding: The Contractor shall:
 - 1. Sow seed using a spreader or seeding machine.
 - 2. Distribute seed evenly over entire area by sowing equal quantity in two directions at right angles to each other.
 - 3. Sow not less than the quantity of seed specified.
 - 4. Cultipacker, or approved similar equipment, may be used to cover the seed and to firm the seed bed in one operation. In areas inaccessible to cultipacker:
 - a. Rake the seed lightly into top 1/8" of soil, roll in two directions with a water ballast roller, weighing not less than 100 pounds per linear foot.
 - b. Take care during raking that seed is not raked from one spot to another.
 - 5. Prevent damage or staining of construction or other plantings adjacent to seeded areas.
 - 6. Prevent foot or vehicular traffic, or the movement of equipment, over the seeded area. Reseed areas damaged as a result of such activity.
 - 7. Water seeded areas thoroughly with a fine spray.
- C. Sod Bed Preparation:
 - 1. Rolling: Roll amended soil with 200 pound water ballast roller.
 - 2. Moistening: After all unevenness in the soil surface has been corrected, lightly moisten the soil immediately prior to laying the sod.
 - 3. Timing: Sod immediately thereafter, provided the sod bed has remained in friable condition.
- D. Sodding Operations:
 - 1. Starter Strip: Lay the first row of sod in a straight line, with subsequent rows parallel to and tightly against each other, with no spaces between strips. Stagger lateral joints. Do not stretch or overlap sod. Butt all joints tightly to eliminate all voids.
 - 2. Cutting: Use a sharp knife to cut sod to fit curves and paving.
 - 3. Tamping and Rolling: Thoroughly tamp and roll sod to make contact with sod bed. Roll each entire section of completed sod.
 - 4. Watering: Thoroughly water sod immediately after installation to wet the underside of the new sod pad and the soil immediately below to a depth of 6 in.
 - 5. Top-Dress Fertilizer: Apply at the rate of six (6) pounds per 1,000 square feet at 25 days and at 50 days after sodding.
 - 6. Prevent foot traffic or vehicular traffic, or the movement of equipment, over the sodded areas. Re-sod areas damaged as a result of such activity.

3.04 MAINTENANCE

The Contractor shall:

- A. Begin maintenance immediately after planting.
- B. Maintain grass until final acceptance of the project.
- C. Maintain grass by watering, fertilizing, weeding, mowing, trimming and other operations such as rolling, regrading, and replanting as required to establish smooth, acceptable grass, free of eroded or bare areas.
 - 1. Cutting Height: Mow grass as soon as there is enough top growth to cut with mower set at the specified height for the principal species planted. Repeat mowing as required to maintain specified height. Do not mow when grass is wet. Time initial and subsequent mowings as required to maintain grass at 1 ½" to 2" height. Do not mow lower than 1 ½"
 - 2. Apply manufactured fertilizer eight weeks after germination at a rate of 100 pounds ammonium nitrate per acre.
 - 3. After grass has started, repeatedly reseed all areas greater than 8" square which fail to show a uniform stand of grass for any reason whatsoever until all areas are covered with a satisfactory stand of grass, as determined by the NAFI.
- D. Watering: Provide and maintain temporary piping, hoses, and watering equipment as required to convey water from water sources and to keep grass areas uniformly moist as required for proper growth.

END OF SECTION 02930

DIVISION 3 - CONCRETE

03100	CONCRETE FORMWORK
03200	CONCRETE REINFORCEMENT
03300	CAST-IN-PLACE CONCRETE

SECTION 03100 - CONCRETE FORMWORK**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Formwork for cast-in-place concrete, complete with shoring, bracing and anchorage.

1.2 RELATED SECTIONS

- A. DIVISION 2 - SITEWORK.
- B. Section 02751 – CEMENT CONCRETE PAVEMENT.
- C. Section 03100 - CONCRETE FORMWORK.
- D. Section 03200 - CONCRETE REINFORCEMENT.
- E. Section 03300 - CAST-IN-PLACE CONCRETE.

1.3 REFERENCE STANDARDS

- A. Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this section where cited by abbreviations noted below.
 - 1. ACI 347 - "Recommended Practice for Concrete Formwork".
 - 2. ACI 301 - "Specifications for Structural Concrete".

1.4 SUBMITTALS

- A. Manufacturer's literature describing products.
- B. Samples: Only as requested.

PART 2 PRODUCTS**2.1 GENERAL**

- A. Form Design and Shoring: The design and engineering of the formwork and shoring, as well as its construction and installation, shall be the responsibility of the Contractor. Formwork shall be designed for loads and lateral pressures outlined in ACI 347 and wind loads as required by the applicable controlling building codes. Design considerations, allowable stresses and other applicable requirements shall conform to ACI 347 and the controlling local building code.
- B. Allowable Tolerances: Formwork shall produce concrete within the following tolerance limits unless otherwise noted.
 - 1. Tolerances for formed surfaces for buildings shall conform to ACI 301.
 - 2. Tolerances for formed surfaces for all other concrete structures shall conform to those outlined in ACI 347, unless otherwise noted.
- C. Cooperation: Fully cooperate with other trades and other sections for the installation of

embedded items. Provide suitable templates, inserts, and sleeves for setting items not placed in the forms.

2.2 MATERIALS

- A. Forms shall be plywood, metal, fiber glass, and/or lumber, as specified below. Form materials furnished shall be new, except that metal and fiber glass forms previously used elsewhere will be permitted, provided that they are free of objectionable holes, dents, distortions, and other defects. After initial use on this project, form materials may be reused thereon provided they will produce acceptable concrete surfaces.
 - 1. Framing, backing, bracing, shoring, and other formwork shall be No. 2 Common or better lumber.
 - 2. Smooth surface forms shall be used for all exterior and interior exposed concrete surfaces including, but not limited to, walls, columns, ceilings, beams, steps, tank and basin interiors, and slab edges and be moisture resistant commercial standard Douglas fir concrete form type plywood, at least five ply, bearing APA grade trade-mark, unless otherwise approved.
 - 3. Unfinished surface forms may be used for all exterior and interior concealed concrete, except tank and basin interiors, and may be No. 2 Common or better lumber, metal or other type of form material except that wood forms shall be used for all surfaces that are to be plastered.
 - 4. Earth forms may be used as side forms of footings where soil conditions are suitable and approved by the NAFI.
- B. Form Ties shall be of the snap tie type which can be removed to at least 1-1/2 inches below concrete surfaces leaving an opening no larger than the tie rod diameter, without cones.
 - 1. Provide ties with integral water stops for all structures which are intended to contain water or other liquid and/or to prevent intrusion of ground or other water.
- C. Form sealer shall be non-staining mineral oil or other approved coating.
 - 1. Form release agent for surfaces intended to receive an applied coating or finish must be compatible with the applied coating or finish.
 - 2. Form coating for potable water containing structures shall be non-toxic after 30 days and not introduce objectionable taste or odor into the water.

PART 3 EXECUTION

3.1 CONSTRUCTION

- A. Construct and erect forms to types, shapes, lines, and grades shown on the drawings with as few joints as practical to insure straight, plumb, level, and smooth concrete surfaces with all angles sharp and true to line and to facilitate safe form removal without damage to concrete. Forms shall have sufficient strength to safely support all construction loads, with no appreciable bulging, sagging, movement, or leakage of mortar, and be clean of all debris at time of concreting.
- B. Camber forms where necessary to maintain specified tolerances.
- C. Provide 3/4 by 3/4 inch chamfer strips in formwork at exposed external corners, including but not limited to those on columns, beams, walls, slab edges, and equipment bases, but not including those on steps.

- D. Bevel, marker and rustication strips shall be applied in straight lines and secured to prevent displacement.
- E. Provide temporary cleanouts and openings in wall and column forms as required for effective removal of loose dirt, debris, and waste material; for inspection of reinforcement; for introduction of vibrators; and where necessary to limit the free fall of the concrete to less than four feet.
- F. Slab Forms:
 - 1. Establish levels and set screeds.
 - 2. Depress slabs where required to receive special floor finishes.
 - 3. Slope to drain where required or shown or noted.
- G. Earth forms for footings shall be cut to sizes and elevations indicated. If dry, all earth or rock surfaces shall be moistened prior to concrete placement.
 - 1. Provide forms for footings wherever concrete cannot be placed against solid earth excavation.
- H. Contact face of forms shall be coated with approved coating; or wood forms may be thoroughly wetted except in freezing weather. Oil coating must be applied and excess wiped off before placing reinforcement.

3.2 OPENINGS IN CONCRETE CONSTRUCTION

- A. Formed Openings: Provide these where required for mechanical, electrical, and other work.
- B. Cutting Openings: Where openings are required in new in-place or existing concrete construction, cut these only at approved locations, as follows:
 - 1. Small opening for pipes, conduits, etc.: cut these with suitable rotary core type drills, without spalling the concrete; do not use star drills, chisels, or similar impact type tools, unless otherwise approved.
 - 2. Large holes for ducts, equipment, doorways, windows, etc.: chip these through the concrete one-half way through each side, to prevent unnecessary spalling and damage to the concrete.

3.3 REMOVAL

- A. Remove forms only with approval, and in a manner that will insure complete safety of the structures. Where the structure as a whole is supported by shores, the forms for beam and girder sides, columns, and similar vertical surfaces may be removed after 24 hours, provided that the concrete has hardened sufficiently to prevent its injury by form removal. Do not in any case remove supporting forms or shoring until the structural members have acquired sufficient strength to safely support their weight and the load which will be placed thereon. Use every precaution to avoid spalling or otherwise damaging concrete by form removal.

END OF SECTION

SECTION 03200 - CONCRETE REINFORCEMENT**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Reinforcing steel bars, welded steel wire fabric for cast-in-place concrete, complete with tie wire, bar supports, splices and other reinforcing devices.

1.2 RELATED SECTIONS

- A. DIVISION 2 - SITEWORK.
- B. Section 02751 – CEMENT CONCRETE PAVEMENT.
- C. Section 03100 - CONCRETE FORMWORK.
- D. Section 03300 - CAST-IN-PLACE CONCRETE.

1.3 REFERENCE STANDARDS

- A. Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work in this section where cited below:
 - 1. ASTM - American Society for Testing and Materials.
 - 2. ACI - American Concrete Institute's.
 - a. ACI 315 - "Details and Detailing of Concrete Reinforcement."
 - b. ACI 318 - "Building Code Requirements for Reinforced Concrete."
 - 3. CRSI - Concrete Reinforcing Steel Institute's.
 - a. CRSI - "Manual of Standard Practice."
 - b. CRSI - "Reinforcing Bar Splices."
 - c. CRSI - "Placing Reinforcing Bars."

1.4 SUBMITTALS

- A. Manufacturer's literature describing products, if requested.
- B. Shop Drawings: Show bending and placing details, size, and location of reinforcing steel. Include diagrammatic wall elevations at scale to show clearly position and erection marks of bars including marginal bars around openings with dowels, splices, etc.
- C. Certified Mill Test Reports.
- D. Samples if required by NAFI.

1.5 STORAGE AND HANDLING

- A. Store reinforcing and accessories in manner to prevent excessive rusting and fouling with grease, dirt, or other bond-weakening coatings.
- B. Take precautions to maintain identification after bundles are broken.

PART 2 PRODUCTS

2.1 REINFORCING STEEL

- A. All reinforcement shall be detailed and fabricated in accordance with ACI 315 and CRSI "Manual of Standard Practice."
- B. Reinforcing bars, except column spirals shall be deformed bars conforming to ASTM A615 "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement," Grade 60 as indicated on the drawings.
- C. Spiral Reinforcement shall be plain bars conforming to ASTM A615, Grade 60; or plain cold drawn steel wire conforming to ASTM A82-85 with a minimum yield strength of 70,000 psi.
- D. Welded Wire Fabric shall conform to ASTM A185.

2.2 REINFORCING BAR SUPPORTS

- A. Bar supports shall be provided as recommended in Chapter 3 of CRSI "Manual of Standard Practice."
 - 1. All bar supports in contact with formwork for surfaces which will be exposed to view; be exposed to weather; receive acoustical plaster or paint; and interior surfaces of structures which will normally contain water: CRSI Class 1, plastic-protected, or CRSI Class 2, stainless steel protected, as approved.
 - 2. For other areas, unless otherwise indicated: CRSI Class 3, bright basic.
 - 3. On ground: concrete blocks, or if required, wire bars Class 3 with sand plates.
- B. Tie wire shall be black annealed wire, 16-1/2 gauge minimum.

PART 3 EXECUTION

3.1 PLACEMENT

- A. General:
 - 1. Place reinforcing steel in accordance with the recommended practices in "Placing Reinforcing Bars" by CRSI, as indicated on the drawings and outlined herein.
 - 2. Do not bend or straighten any reinforcing steel in a manner which will weaken or damage the material, nor heat reinforcing steel for bending or straightening.
 - 3. All splices of reinforcement, minimum concrete cover, placing tolerances and bar spacings shall conform to ACI 318 and to recommended practices in "Reinforcement Anchorages and Splices" by CRSI.
- B. Supports:
 - 1. Reinforcing steel shall be accurately placed in the forms and adequately supported and secured against displacement within the tolerances outlined in ACI 318.
 - 2. Provide spaces, chains, bolsters, and other metal accessories to support all reinforcing steel and secure it in proper position before and during concrete placement.

- C. Splices shall be as indicated on the drawings. Generally splice bottom bars at points of support and top bars at mid-span of slabs, beams, and girders. Avoid splices at points of maximum tensile stress. Stagger horizontal and vertical splices.
- D. Reinforcing steel shall not be welded.
- E. Protection Against Rust:
 - 1. Where there is danger of rust staining adjacent surfaces, wrap reinforcement with impervious tape or otherwise prevent rust staining.
 - 2. Remove protective materials and clean reinforcement as required before preceding with concrete placement.
- F. Prior to concrete placement, verify reinforcement has been properly bent, positioned, and secured in accordance with drawings; and remove ice, oil, grease, dirt, or other bond-weakening coatings.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Cast-in-place concrete complete with vapor barrier under slabs on grade, expansion joint fillers, water stops, and anchorage items including slots, inserts, anchors, and bolts.

1.2 RELATED SECTIONS

- A. DIVISION 2 - SITEWORK.
- B. Section 02300 - EARTHWORK.
- C. Section 02751 - CEMENT CONCRETE PAVEMENT.
- D. Section 03100 - CONCRETE FORMWORK.
- E. Section 03200 - CONCRETE REINFORCEMENT.
- F. DIVISION 5 - METALS.
- G. DIVISION 15 - MECHANICAL.
- H. DIVISION 16 - ELECTRICAL.

1.3 REFERENCE STANDARDS AND CODES

- A. Published Specifications, standards, tests, or recommended methods of trade, industry or governmental organizations apply to work in this section where cited below:
 - 1. ASTM - American Society for Testing and Materials.
 - 2. ACI - American Concrete Institute.
 - 3. FS - Federal Specifications.
- B. Materials and work shall conform to the requirements of standards, codes, and recommended practices required in this section. In conflicts between industry standards, required standards and this specification, or this specification and the local building code, the more stringent requirement shall govern.
 - 1. Applicable Standards and Codes:
 - a. ACI 301 - "Specifications for Structural Concrete for Buildings."
 - b. ACI 318 - "Building Code Requirement for Reinforced Concrete."
 - c. ASTM C94 - "Standard Specification for Ready-Mixed Concrete."

1.4 QUALITY ASSURANCE

- A. Concrete work shall conform to all requirements of ACI 301 "Specifications for Structural Concrete for Buildings", except as modified and supplemented herein.

1.5 SUBMITTALS

- A. Manufacturer's literature describing products.

- B. Contractor shall prepare and submit for approval preliminary mix design for each class of concrete specified.
- C. Contractor shall name his source of supply for concrete materials and submit representative samples of aggregates and cement and reports of quality tests for approval.
- D. Other samples only as requested.

1.6 STORAGE OF MATERIALS

- A. Store concrete materials in a manner which will effectively segregate each type of material from each other, prevent contamination of materials, and protect the materials from damage by weather and other causes.

1.7 INSPECTION AND TESTING

- A. See TESTING LABORATORY SERVICES in DIVISION 1.
- B. The NAFI and testing laboratory shall have free access to all points where concrete materials are stored, proportioned or mixed, and all materials, equipment and methods used shall be subject to their inspection, tests, and approval.
- C. An Independent testing laboratory shall perform following services:
 1. Test of Portland Cement, one test for each separate carload or certified mill test reports of cement.
 2. Test coarse and fine aggregates.
 3. Design and test all mixtures (with admixtures included) to be used on project.
 4. If concrete materials are batched away from the project site and mixed on the project or transported to project in mixer or agitator trucks, laboratory inspection shall be provided at job site for checking materials deliveries and concrete consistencies on all pours in excess of 24 cubic yards and on others if required by NAFI.
 5. Cast, cure, and test cylinders of the concrete actually placed on the job, all in accordance with ASTM C31 and ASTM C39, and as follows:
 - a. Quantity of test cylinders required: at least six cylinders of each day's concrete placing, but not less than six cylinders for each 100 cubic yards of concrete placed, and not less than six cylinders for each 5,000 square feet of surface area of concrete placed.
 - b. Testing requirements: test one laboratory and one field cured cylinder at seven days; test one laboratory and one field cured cylinder at 28 days; and hold one field cured and one laboratory cured cylinder in reserve for 28 day or later testing, as required.
 6. Slump tests, using ASTM C143, of concrete sample for each strength test and whenever in the NAFI's opinion consistency of concrete appears to vary.
 7. Test for air content of normal weight concrete sample for each cylinder in accordance with ASTM C173.
 8. Test for air content and unit weight of lightweight concrete sample for each strength test in accordance with ASTM C173 and ASTM C567.
 9. Determine temperature of concrete sample for each strength test.
 10. Test reports shall be promptly furnished by the laboratory to the Contractor and the NAFI.

11. Daily reports of pouring shall be furnished, giving the date, location, and yardage of pour, specifying materials, proportions, consistencies and class of concrete used, the test cylinder number representing pour, and the weather conditions prevailing.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Cement: ASTM C150, Type I or Type II, unless otherwise approved. Use only one brand of cement throughout the project unless otherwise approved by the NAFI.
- B. Aggregates for normal weight concrete shall conform to ASTM C33:
 1. Coarse aggregate: crushed limestone.
 2. Fine aggregate: clean sand.
- C. Water: Clean and potable, free from impurities detrimental to concrete.
- D. Admixtures: Use only when conditions of use are approved, or as specified elsewhere in these specifications.
 1. Water reducing admixture: Eucon WR-75 by the Euclid Chemical Company, Pozzolith 200N by Master Builders or Plastocrete 160 by Sika Chemical Corporation. The admixture shall conform to ASTM C494, Type A, and not contain more chloride ions than are present in municipal drinking water.
 2. Water reducing, retarding admixture: Eucon Retarder-75 by the Euclid Chemical Company, Pozzolith XR by Master Builders or Plastiment by Sika Chemical Corporation. The admixture shall conform to ASTM C494, Type D, and not contain more chloride ions than are present in municipal drinking water.
 3. High range water reducing admixture (superplasticizer): Eucon37 by the Euclid Chemical Company or Sikament by Sika Chemical Corporation. The admixture shall conform to ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
 - a. Non-Corrosive, Non-Chloride Accelerator: "Accelguard 80" by The Euclid Chemical Company or "Darex Set Accelerator" by W.R. Grace. The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.
 4. Air Entraining Admixture: Conform to ASTM C260.
 - a. Calcium Chloride: Calcium chloride, thicyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
 5. Certification: Written conformance to above mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Engineer.
- E. Bonding Compound: Euco Weld by the Euclid Chemical Company or Weldcrete by the Larsen Company. The compound shall be a polyvinyl acetate, rewettable type.

- F. Epoxy Adhesive: Euco Epoxy #452 or #352 by the Euclid Chemical Company or Sikadur Hi-Mod by Sika Chemical Corporation. The compound shall be a two component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces.
- G. Non-Slip Aggregate: Aluminum oxide type. Non-slip by the Euclid Chemical Company, Frictex NS by Sonneborn Contect, Fut-Sure by General Abrasive Company, Exolon Anti-Slip by the Exolon Company or approved equal.
- H. Non-Shrink Grout: Factory premixed grout containing metallic aggregates or mineral aggregates and requiring only addition of water at the site. "Firmix" (metallic) or "Euco NS" (non-metallic) by The Euclid Chemical Company, "Embeco 153" (metallic) or "masterflow 713" (non-metallic) by Master Builders. The grout shall conform to CRD-621, "Corps of Engineers Specifications for Non-Shrink Grout".
- I. Curing Materials:
 - 1. Waterproof Paper: ASTM C171, Type 1, regular. Same as Fortifiber Corporation's Orange Label Sisalkraft, or approved equal.
 - 2. Sheet Plastic: Polyethylene, 4 mils thick, fungus resistant.
 - a. Curing and Sealing Compound: Super Rez Seal or Super Pliocure by the Euclid Chemical Company or Masterseal 66 by Master Builders. The Compound shall conform to Federal Specification TT-C-800A, 30 percent solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per square cm. when applied at a coverage rate of 300 square feet per gallon. Manufacturer's certification required.
- J. Dissipating Resin Curing Compound: The compound shall be a dissipating resin type compound, conforming to ASTM C309, Type I, "Kurez DR" by The Euclid Chemical Company or approved equal. The film must chemically break down in a two to four week period after application.
 - 1. Curing compounds shall not be used on any surface against which additional concrete or other cementitious materials are to be bonded.
- K. Expansion Joint Fillers:
 - 1. ASTM D1751 - "Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)."
 - 2. ASTM D1752 - "Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction."
 - 3. Verify compatibility of joint filler with sealant specified.
- L. Anchorage Items: Cast-in-place slots, bolts, and inserts for anchoring masonry finish and mechanical items to concrete shall be of the types indicated and/or required to accommodate the subsequently installed fastening devices.
- M. Vapor Barrier: 10 mil clear polyethylene film, type recommended for below grade application. Provide continuous-taped joints. Protect vapor barrier from tears and punctures.

2.2 PROPORTIONING

- A. Proportioning of ingredients for each class of concrete required shall be in accordance with ACI 301 Method 1, laboratory trial batches, or Method 2, past field experience using materials to be employed on the project to produce placability, durability, specified strengths and properties specified.
 - 1. This section shall propose mix designs prepared in accordance with Method 1 (trial batches) or Method 2 (field experience) of ACI 301.
 - 2. If trial batches are used, this section shall instruct Laboratory to base mix designs on use of materials tested and approved by the Testing Agency.

2.3 CONCRETE QUALITIES REQUIRED

- A. Strength: Specified compressive strength at 28 days shall be 3,000 psi and 4,000 psi at locations indicated on the drawings.
 - 1. Average strength shall exceed specified compressive strength as required in accordance with ACI 318.
- B. Water-Cement Ratio: All concrete subjected to freezing and thawing shall have a maximum water-cement ratio of 0.54 by weight. All concrete subjected to deicers and/or required to be watertight shall have a maximum water-cement ratio of 0.45.
- C. Minimum Cement Content:
 - 1. 480# for $f'_c=3000$ psi concrete.
 - 2. 560# for $f'_c= 4000$ psi concrete.
- D. Air Content: All concrete subjected to freezing and thawing after curing and/or required to be watertight shall be air entrained. Total air content as determined in accordance with ASTM C173 shall be:
 - 1. 5 (+/-1) percent for coarse aggregate size No. 467 (1-1/2 inch maximum).
 - 2. 6 (+/-1) percent for coarse aggregate size No. 57 (one inch maximum) or No. 67 (3/4 inch maximum).
 - 3. All interior slabs to receive a surface hardener or subject to abrasion shall have a maximum total air content of three percent.
- E. Slump: As determined by ASTM C143 for concrete to be vibrated:
 - 1. Footings and substructure walls: five inches maximum, two inches minimum.
 - 2. Slabs, beams, columns, and walls: four inches maximum, two inches minimum.

PART 3 EXECUTION

3.1 PRODUCTION OF CONCRETE

- A. Concrete shall be ready-mixed, batched, mixed, and transported in accordance with ASTM C94, "Standard Specification for Ready-Mixed Concrete."
 - 1. Plant equipment and facilities shall conform to "Certification of Ready Mixed Concrete Production Facilities (Checklist with Instructions)" of the National Ready Mixed Concrete Association.

3.2 PREPARATION

- A. Approval: Prior to placing concrete, give the NAFI sufficient advance notice of each proposed placing. Do not place any concrete on any subgrade or in any formwork until

the subgrade, formwork, reinforcing steel, anchor bolts, and other embedded items for the placement involved have been inspected and approved by the NAFI.

- B. Bonding and Grouting: Before depositing new concrete on or against concrete which has set, treat existing concrete surfaces which will receive additional concrete, as follows: thoroughly roughen existing concrete surfaces and remove laitance, foreign matter, and loose particles; retighten forms at junction of existing and new concrete; dampen (but do not saturate) existing concrete surfaces; and slush existing concrete surface with cement-sand grout of proportions similar to those of the concrete. Grout coat shall be as thick and practicable on vertical surfaces, and at least 1/2 inch thick on horizontal surfaces. Place new concrete before grout has attained its initial set.
- C. Install construction joints at locations indicated on drawings. Except where indicated, no construction joints will be permitted without prior specific approval. Vertical construction joints in wall footings shall be reduced to a minimum. Construction joints in slabs and walls, where permitted, shall be located and made so that the strength and usefulness of the structure will not be impaired.
 - 1. Unless otherwise indicated, the unit of operation shall not exceed the following in any horizontal direction: slabs on grade intended to retain water or other liquid, 50 feet; other slabs on grade, 20 feet; walls intended to retain water or other liquid, 20 feet; other walls, 40 feet.
- D. Expansion joints shall be provided at locations indicated on drawings. Joint filler shall be as specified. Do not permit reinforcement or other embedded metal items bonded to concrete (except dowels bonded on only one side of joint) to extend through any expansion joint.
- E. Contraction joints shall be provided at locations indicated on the drawings and as directed by the NAFI.
 - 1. Contraction joints may be formed, tooled or sawed approximately equal to 1/3 the thickness of slab.
- F. Install waterstops in all expansion joints and construction joints in each structure designed to contain water or other liquid, or designed to prevent intrusion of water or other liquid, as indicated and/or as required to provide watertight structures. Arrange all waterstops to provide continuous seals in all joints between the separate concrete placements in each such structure. Carefully fit all waterstops to form turns, tees, crosses, and other arrangements as required to provide a complete, continuous water seal in all joints subject to leakage. Heat weld all joints in waterstops, and install as recommended by manufacturer.
 - 1. Waterstop shall be securely held in position so that it will not be displaced during concreting. Exercise care to avoid contamination of waterstop surface by form coatings or other substances which would adversely affect bonding.
- G. Placing Embedded Items: Expansion joint material, waterstops and other embedded items shall be positioned accurately and securely against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent entry of concrete into voids.
- H. Anchor bolts shall be set with templates according to approved shop drawings.
- I. Slabs on grade shall be placed on properly leveled and thoroughly compacted sub-grades or granular fill, as indicated. All sub-soils for slabs shall be approved before

placing concrete. At locations indicated provide one layer of vapor barrier material, lapped, taped and sealed at joints.

- J. Concrete Foundations for Mechanical Equipment: Provide concrete pads required under all mechanical equipment. Set bolts, anchors, piping, etc., in concrete as required by manufacturer of equipment used. See mechanical drawings and details for size, design, and location of equipment requiring concrete pads. Pads shall be steel trowel finished on all top exposed surfaces.
 - 1. Pads shall be 3,000 psi lightweight concrete when located on structural slabs.

3.3 PLACEMENT

- A. Conveying: Convey concrete from mixer to forms as rapidly as practicable without segregation or loss of ingredients, continuously and at such a rate that no unfinished area will be left exposed or unworked before the concrete takes its initial set. Do not deposit concrete initially set. Cast concrete within one hour after adding water unless otherwise noted. Retempering of concrete which has partially set will not be permitted.
- B. Take precautions to avoid damage to under-slab waterproofing and displacement of reinforcement and formwork.
- C. Chute Placement: When concrete is conveyed by chute, maintain a continuous flow of concrete. Chute shall be of metal or metal-lined wood, with sections set at approximately the same slope, which shall not be less than one vertical to three horizontal, and not more than one vertical to two horizontal. Discharge end of chute shall be provided with a drop chute to prevent segregation. If height of discharge end of chute is more than three times the thickness of the layer being deposited, but not more than four feet above surface of concrete in forms, use a spout with its lower end maintained as near surface of deposit as practicable. When pouring is intermittent, chute shall discharge into a hopper. Clean chutes thoroughly before and after each run. Discharge waste materials and flushing water outside forms. Raised runways for wheeling concrete to place shall be provided when necessary.
- D. Deposit concrete in approximately horizontal layers of 12 to 18 inches as near as possible to its final position. Do not allow concrete to drop vertically more than 3 or 4 feet, nor through a cage of reinforcing steel except when an elephant trunk or tremie is used.
 - 1. Elephant trunks or tremies shall be used in deep walls and columns to prevent free fall of concrete and to allow placement through cage of reinforcement.
- E. Keep forms and reinforcement clean above pour line by removing clinging concrete with wire brush before casting next lift. Also remove leakage or laitance through forms.
- F. Interruption in casting longer than 45 minutes shall be cause for discontinuing casting for remainder of day. In this event, cut back concrete and provide construction joints as the NAFL directs; clean forms and reinforcement as necessary to receive concrete at later time.
- G. Continuously place concrete in units between construction joints so that each unit will be monolithic in construction. Concrete placement rate shall be such that surface of concrete not carried to construction joints will not have attained initial set before additional concrete is placed in the construction unit involved. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at same time as slabs. In

walls of structures having door, window, or other openings, lifts of individual pours shall terminate at the tops or bottoms of the openings. Other lifts shall terminate at levels indicated, or to conform to structural requirements or architectural details, or both, as approved. Special provisions shall be made for joining successive pours as detailed or as approved. At least 48 hours shall elapse before placing concrete in the adjoining unit at each construction joint.

- H. Compaction: During and immediately after depositing concrete compact each layer by mechanical internal vibrating equipment supplemented by hand spading, rodding, and tamping, as required. Do not use vibrators to transport concrete inside of forms. Form vibrators shall not be used. Internal vibrators shall maintain not less than 5,000 impulses per minute when submerged in the concrete; maintain at least one vibrator as a stand-by. Limit vibrator duration to the time necessary to produce satisfactory consolidation without causing objectionable segregation. Do not insert vibrator into lower courses which have begun to set. Apply vibrators at uniformly spaced points not farther than the visible effectiveness of the machine. Vibrate thoroughly all concrete at all waterstops to insure their complete embedment in solid concrete.
- I. Hot Weather Concreting: Conform to ACI 305R and following requirements when mean daily temperature rises above 85 degrees Fahrenheit.
 - 1. Temperature of concrete as placed shall be lowest temperature practicable but not higher than 85 degrees Fahrenheit, unless approved otherwise by the NAFI.
 - 2. Crushed ice in lieu of water will be approved to maintain concrete below maximum temperature.
 - 3. Addition of water-reducing retarders will be permitted only if the NAFI approves and mix is redesigned.
 - 4. Concrete shall be discharged within 45 minutes after adding water.
- J. Cold Weather Concreting: Conform to ACI 306R and following requirements when mean daily temperature falls below 40 degrees Fahrenheit.
 - 1. Reinforcement, forms, or ground to receive concrete shall be completely free from frost.
 - 2. Minimum temperature of concrete as placed shall be 50 degrees Fahrenheit.
 - 3. Concrete shall be maintained at temperature no lower than 50 degrees Fahrenheit for minimum seven day period after placement.
 - a. Only the specified non-corrosive, non-chloride accelerator may be used. Calcium chloride, thicyanates, or admixtures containing more than 0.05 percent chloride ions are not permitted.

3.4 REPAIR OF SURFACE DEFECTS

- A. Fin and Protrusion Removal: Immediately after form removal, remove fins and other unnecessary protrusions, flush with concrete surfaces.
- B. Filling and Patching: Surface defects including tie holes, shall be repaired immediately after form removal using one of the following appropriate methods.
 - 1. For concrete surfaces to receive rubbed finish: as soon as practicable after form removal, fill and patch tie holes honeycombs, voids, and other unnecessary holes, as follows:
 - a. Remove all loose material.
 - b. Wet concrete for 8 hours before patching.
 - c. Mop surface to receive patch, with slurry of cement and water.

- d. Fill with "dry" grout of sand and cement in the same proportions as those of the concrete, except with only enough water added to provide a mix that will "ball" in the hand. Force grout into cavities with the greatest practicable pressure.
 - e. Finish surface to match adjacent area.
 - f. Cure fill as specified under curing.
- 2. For concrete surfaces to receive waterproof coating and finish: as soon as practicable after form removal, fill and patch tie holes, honeycombs, voids, and other unnecessary holes with commercially prepared patching material. Standard Dry Wall Products "Thorite" or as approved, which has high bonding characteristics; 5,000 psi minimum 28 day strength; recommended by the manufacturer for use in contact with potable water without emitting objectionable tastes or odors to the water; and compatible with the Waterproof Coating and Finish specified above. Apply patching material in strict accordance with the manufacturer's printed instructions.

3.5 FINISHING OF FORMED SURFACES

- A. Immediately after forms have been removed and concrete surfaces have been repaired as specified under "Repair of Surface Defects" concrete surfaces shall be given one or more of the following finished in locations indicated or specified hereinafter. When completed the finished exposed concrete surfaces shall be free of defects, with corners, jams, arrises, and angles straight, plumb, true to line, and level, as applicable.
- B. Rubbed Finish: Immediately after form removal, completely rub and finish the concrete surfaces with abrasive stones, as required to obtain uniform and approved surface texture and color.
- C. Waterproof Coating and Finish: Remove all form release products and membrane curing compounds and apply a waterproof coating. Coating shall be as recommended by the manufacturer for this application, strictly waterproof and shall bond securely to the concrete surfaces.
 - 1. Waterproof coating shall be Standard Dry Wall Products "Thoroseal" mixed with Acryl 60 bonding agent, or an equal waterproof coating, applied in two coats in strict accordance with the manufacturer's printed instructions to produce a sand textured finish.
- D. Related Unformed Surfaces: Tops of walls or buttresses, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and be floated to a texture reasonably consistent with that of the formed surfaces. Continue final finish on formed surfaces uniformly across the unformed surfaces.

3.6 CONCRETE SLAB FINISHES

- A. General: Finish concrete slabs as specified below. Dusting of wearing surfaces with dry materials will not be permitted. In preparation for finishing, strike slabs off true to the required elevations and grades of the finished slabs. Slabs shall be level with a tolerance of 3/8 inch in 10 feet, except where drains occur or slopes are indicated, in which case the slabs shall be pitched to the drains or sloped, as applicable.
- B. Wood Float Finish: Finish slabs by screeding and floating with straight edges to bring the surface to the required finished elevation. While the concrete is still green but sufficiently

hard to bear a man's weight without deep imprint, wood float the surface to a true even plane with no coarse aggregate visible using sufficient pressure on the wood floats to bring moisture to the surface.

- C. Steel Trowel Finish: First wood float finish the slabs as specified in the paragraph above. Then hand finish the concrete with a steel trowel to produce a smooth impervious surface free from trowel marks.
- D. Machine Finish: Suitable machines may be used to finish the concrete, provided that they produce satisfactory final finishes at least equal to those normally obtained by the hand finishing methods specified above.

3.7 CURING

- A. General: Take curing measures immediately after casting and extend period according to the NAFI's recommendation based upon prevailing temperature, wind, and relative humidity.
 - 1. Keep concrete continuously moist for minimum 14 days after casting.
 - 2. Maintain concrete temperature at minimum 50 degrees Fahrenheit for seven days after casting.
 - 3. Avoid alternate wetting and drying and fluctuations of concrete temperature.
 - 4. Protect fresh concrete from direct rays of sun, rain, drying winds, soiling, and damage.
 - 5. Do not permit curing method to affect adversely finishes or treatments applied to finished concrete.
- B. Curing Methods for Slabs: Cure all concrete surfaces with one or a combination of the following methods. Where a specific curing procedure is not specified, at the Contractor's selection, one or more of the following methods shall be used.
 - 1. Water curing: keep concrete surfaces continuously wet with clean water during the curing period by immersion, maintaining a continuous flow of water over the surface, continuous spraying, continuous sprinkling or a combination of these. For all curing methods, the difference in temperature between the water used for curing and the concrete shall not exceed 20 degrees Fahrenheit.
 - 2. Wet coverings: cover the concrete surfaces with burlap, cotton mats, sand, earth, or other suitable moisture retaining materials and keep these materials saturated during the curing period. Lap all fabrics at least 8 inches at all joints. On exposed concrete, do not use any type covering which will discolor the concrete surface.
 - 3. Waterproof coverings: as soon as possible after finishing, thoroughly wet the concrete surfaces and cover the concrete surfaces with waterproof paper or plastic film immediately after wetting. For a period of at least 8 hours after the concrete has taken its initial set, maintain a continuous flow of clean water over the concrete surface under the covering. Lap all joints in the covering at least 8 inches and provide weights and other means and methods to keep the waterproof covering in direct contact with the concrete during the curing period.
 - 4. Membrane forming curing compounds: an approved liquid membrane forming curing compound may be used after one of the curing methods specified above has been used for at least 24 hours after the concrete has taken its initial set. The membrane forming curing compound shall be applied in strict accordance with the manufacturer's printed instructions. Apply in two coats at right angles to each other at a rate of 200 square feet coverage per gallon per coat unless

otherwise recommended by the manufacturer. Apply coats uniformly and free of pinholes, gaps, puddles, and runs.

- a. Membrane forming curing compound used on potable water containing structures shall be nontoxic and taste and odor free.
- C. Curing Methods for Walls: Cure all concrete walls as follows: Keep forms wet during period forms are required to remain in place. Immediately after formed concrete has taken its initial set, start a gentle uniform flow of clean water over concrete to thoroughly wet all concrete surfaces and formwork and maintain this flow of water until forms are removed. Immediately after form removal, cure concrete surfaces with one of the curing methods specified above.

END OF SECTION

DIVISION 4 - MASONRY

04220 CONCRETE UNIT MASONRY
04810 UNIT MASONRY ASSEMBLIES

SECTION 04220 - CONCRETE UNIT MASONRY**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Load bearing block.
- B. Non-load bearing block.
- C. Reinforcement, anchorages, and accessories.
- D. Fire Rated Block.

1.2 RELATED SECTIONS

- A. DIVISION 3 - CONCRETE.
- B. Section 04810 – UNIT MASONRY ASSEMBLIES.
- C. Section 07620 - SHEET METAL FLASHING AND TRIM.
- D. DIVISION 8 - DOORS AND WINDOWS.
- E. Section 09900 - PAINTING.

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to a minimum of 50 degrees Fahrenheit (10 degrees C) prior to, during, and 48 hours after completion of masonry work.

1.4 SUBMITTALS

- A. Concrete Block and Concrete Brick: Submit current laboratory tests establishing that units meet ASTM requirements.
- B. Submit manufacturer's literature and samples on box wall ties, reinforcing, and dovetail ties and slots.

PART 2 PRODUCTS**2.1 MATERIALS**

- A. Concrete Block: Concrete block for back-up of exterior walls, for certain interior partitions, and for other usage as indicated shall be load bearing type of lightweight aggregate, hollow, Class A block having gross compressive strength of 1,000 pounds per square inch minimum, and otherwise conforming to requirements of ASTM C90.
 - 1. Block shall be of standard size best suited for the masonry wall widths shown and as indicated on detail sections.
 - 2. Furnish bond beam, lintel, and other special blocks where indicated or required for

the construction shown.

- B. Concrete Brick which may be used interchangeably with concrete block units for fitting, and elsewhere as may be indicated, shall conform to requirements of ASTM C55 for Grade A units.
- C. Reinforcing: For block partitions, block and tile composite partitions, single wythe exterior walls, and composite exterior walls are to be ladder type reinforcing, Dur-O-Wal or as approved, bright basic steel, with galvanized cross rods for cavity type, of widths and types as follows:
 - 1. For exterior walls of a single width of 8 inch nominal block and for partitions of 8 inch nominal concrete block - 6 inch single width type, extra heavy.
 - 2. For any other conditions not covered in the preceding, furnish material for proper width and type for the specific use.
- D. Dovetail Ties: For tying masonry to back-up concrete walls and where abutting concrete, ties shall be corrugated galvanized type with dovetail for fitting into dovetail anchor slot placed in concrete, Hohmann and Barnard No 303 or as approved, 1" wide by 12 gauge by 3-1/2" for tying veneer to back-up walls and by 5-1/2 inch for tying where abutting concrete.
- E. Dovetail Slots: Shall be standard type mating with the dovetail ties specified, of minimum 24 gauge galvanized sheet metal, with filler to keep slot clean during concrete pouring.
- F. Control Joints: Premolded wide flange, Rapid Polyjoint as manufactured by Dur-O-Wal Products or as approved, and constructed of polyvinyl chloride of equivalent durometer hardness and shear strength. The premolded unit shall be of the required length and configuration for the type of application involved with one side convex for backing of caulking and the other side concave for a finish joint.
 - 1. Joints shall not exceed 30'-0" on center unless indicated or required otherwise by the manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All masonry work shall be installed in a first class manner by craftsmen experienced and skilled in the type of work involved. All masonry units shall be laid to a line and plumb, in full accordance with the measurements and details shown.
- B. Cooperate with all other trades in the erection of chases, built-in work, embedded items, etc., required by them in the installation of their work.
- C. All units in walls shall be laid in a running bond, with all intersections and corners fully bonded by the use of interlocking masonry units.
- D. Concrete block shall be laid in a full bed of mortar to the solid face of the block both in the bed and on ends. Joints in block that will be concealed by other finish may be left as cut joints. Joints which will be exposed shall be ribbed with a rounded tool, and care shall be exercised to obtain walls of a first class appearance. Fins and protrusions shall be removed as the work progresses.

- E. All masonry walls shall be reinforced in alternate courses with the Dur-O-Wal reinforcing specified hereinbefore, installed in accordance with the manufacturer's directions, and lapped at joints, corners, and intersections.
- F. In the case of composite type walls, the reinforcing shall be laid so as to span the cavity space and extend into the width of masonry on each side. For exterior walls, the reinforcing shall be cavity type with drip feature.
- G. All masonry walls shall be coursed to an 8 inch vertical module with block coursed 8 inches for a block and joint.
- H. Ties for tying other masonry to concrete back-up walls are to be set 16 inches on center vertically and 24 inches on center horizontally.
- I. Weep holes shall be located in exterior walls above the level of the air space waterproofing, sills, lintels, and other points as necessary to "bleed" all water that might be trapped in the wall to the exterior of the wall.
- J. Do all miscellaneous masonry work as indicated, and/or necessary to the construction shown, in accordance with the best practice.
- K. Control Joints: Provide control joints continuous from bottom of wall to top of wall with the least number of joints.

3.2 CLEANING AND POINTING

- A. After all masonry has been completed, all exposed work, both interior and exterior, shall be cleaned. Use only clean water and approved cleaning agent. Do not use acid except with special permission. Excess of fins of mortar shall be scraped off, open holes and joint defects shall be pointed, and the entire work shall be left in a first class approved condition.

3.3 LINTELS AND BOND BEAMS

- A. Provide reinforced concrete U-Block Lintels where required and/or indicated. Provide two #4 rods at each opening up to and including 3'-0" wide, and two #5 rods at each opening over 3'-0" wide up to 4'-6" in width. These rods shall be placed in a U-Block Lintel and grouted solid with 3000 psi grout. The rods and U-Blocks shall extend a minimum of 8 inches beyond edge of jambs for proper bearing. Provide temporary support at opening until properly cured to hold the loads.
- B. Structural bond beams as indicated for other supports shall be as indicated on structural or architectural drawings.

3.4 GROUTING OF DUCTS, PIPES, ETC., THAT PASS THRU CONCRETE BLOCK WALLS

- A. Where metal ducts, fire dampers, conduits, pipes, etc. pass through fire walls at chases, shafts, etc., all joints shall be grouted solid. All joints shall be air tight.

END OF SECTION

SECTION 04810 UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units.
 - 2. Face brick.
 - 3. Mortar and grout.
 - 4. Masonry joint reinforcement.
 - 5. Ties and anchors.
 - 6. Embedded flashing.
 - 7. Miscellaneous masonry accessories.
 - 8. Cavity-wall insulation.
- B. Related Sections include the following:
 - 1. Division 7 Section "Bituminous Dampproofing" for dampproofing applied to cavity face of backup wythes of cavity walls.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
- C. Products furnished, but not installed, under this Section include the following:
 - 1. Dovetail slots for masonry anchors, installed under Division 3 Section "Cast-in-Place Concrete."
 - 2. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."
- D. Products installed, but not furnished, under this Section include the following:
 - 1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
 - 2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
 - 3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames".

1.3 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Samples for Initial Selection: For the following:
 - 1. Unit masonry Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
 - 2. Colored mortar Samples showing the full range of colors available.

C. Samples for Verification: For the following:

1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
3. Weep holes/vents in color to match mortar color.
4. Accessories embedded in the masonry.

D. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

B. Sample Panels: Before installing unit masonry, build sample panels, using materials indicated for the completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build sample panels for each type of exposed unit masonry assembly in sizes approximately 96 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.

1. Locate panels in the locations indicated or, if not indicated, as directed by NAFI.
2. Clean exposed faces of panels with masonry cleaner indicated.
3. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
4. Protect approved sample panels from the elements with weather-resistant membrane.
5. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by NAFI in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by NAFI in writing.
7. Demolish and remove sample panels when directed.
8. Include all exterior wall components in sample.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
 - 1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit

masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 100 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 2. Provide square-edged units for outside corners, unless indicated as bullnose.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
1. Weight Classification: Light weight.
 2. Provide Type I, moisture-controlled units.
 3. Size (Width): Manufactured to the following dimensions:
 - a. 8 inches (203 mm) nominal; 7-5/8 inches (194 mm) actual.
 - b. 12 inches (305 mm) nominal; 11-5/8 inches (295 mm) actual.
 4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
 - a. Where units are to be left exposed, provide color and texture matching the range represented by approved sample.

2.2 BRICK

- A. General: Provide shapes indicated and as follows for each form of brick required:
1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.
- B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- C. Face Brick: ASTM C 216, Grade SW, Type FBS, and as follows:
1. Initial Rate of Absorption: Less than 20 g/30 sq. in. (20 g/194 sq. cm) per minute when tested per ASTM C 67.
 2. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 3. Surface Coloring: Brick with surface coloring, other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m).
 4. Size: Manufactured to the following actual dimensions:
 - a. Modular: 3-1/2 to 3-5/8 inches (89 to 92 mm) wide by 2-1/4 inches (57 mm) high by 7-1/2 to 7-5/8 inches (190 to 194 mm) long.
 5. Application: Use where brick is exposed, unless otherwise indicated.
 6. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
 7. Typical Brick
 - a. Columbus Brick
 - b. Boral Brick
 - c. Tri-State.

2.3 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C 91, Type S.
- B. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- C. Aggregate for Grout: ASTM C 404.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- E. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
- F. Water: Potable.
- G. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 1. Masonry Cement:
 - a. Masonry Cement; Blue Circle Cement.
 - b. Brixment-in-Color; Essroc Materials, Inc.
 - c. Mortamix Masonry Cement; Holnam, Inc.
 - d. Or Equal

2. Mortar Pigments:

- a. True Tone Mortar Colors; Davis Colors.
- b. Centurion Pigments; Lafarge Corporation.
- c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.
- d. <Insert product and manufacturer.>

3. Water-Repellent Admixture:

- a. Mortar Tite; Addiment Inc.
- b. Dry-Block Mortar Admixture; W. R. Grace & Co., Construction Products Division.
- c. Rheopel; Master Builders.

2.4 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60 (Grade 400).

2.5 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
 - 1. Mill galvanized, carbon-steel wire for interior walls.
 - 2. Hot-dip galvanized, carbon-steel wire for exterior walls.
 - 3. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units where indicated.
- B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches (407 mm) o.c.
- C. For multiwythe masonry, provide types as follows:
 - 1. Adjustable (2-piece) type with single pair of side rods and cross ties spaced not more than 16 inches (407 mm) o.c. and with separate adjustable veneer ties engaging the cross ties. Cross ties are either U-shaped with eyes or rectangular. Space side rods for embedment within each face shell of backup wythe and size adjustable ties to extend at least halfway through outer wythe but with at least 5/8-inch (16-mm) cover on outside face.
 - a. Use on all exterior block and brick walls.

2.6 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Mill Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 641 (ASTM A 641M), Class 1 coating.
- C. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- D. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.7 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from **0.1875-inch- (4.8-mm-)** diameter, hot-dip galvanized steel wire. Mill galvanized wire may be used at interior walls where humidity does not exceed 75 percent.

2.8 ANCHORS FOR CONNECTING TO CONCRETE

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section: Dovetail anchor section formed from **0.0528-inch- (1.35-mm-)** thick, steel sheet, galvanized after fabrication.

2.9 ADJUSTABLE MASONRY-VENEER ANCHORS

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - 1. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
- B. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie section and a metal anchor section complying with the following requirements:
 - 1. Anchor Section: Sheet metal plate with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
 - a. Plate 1-1/4 inches (32 mm) wide by **6 inches (150 mm)** long with strap 5/8 inch (16 mm) wide by **3-5/8 inches (92 mm)** long; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than 1/32 inch (0.8 mm).
 - 2. Wire Tie Section: Triangular- shaped wire tie sized to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face.
 - 3. Fabricate wire tie sections from **0.1875-inch- (4.8-mm-)** diameter, hot-dip galvanized steel wire.
- C. Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 (4.8-mm) diameter by length required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion protective coating:
 - 1. Organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.

2.10 MISCELLANEOUS ANCHORS

- A. Dovetail Slots: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.0336-inch (0.85-mm), galvanized steel sheet.

2.11 EMBEDDED FLASHING MATERIALS

- A. Through Wall Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
 - 1. Asphalt-Coated Copper Flashing: Manufacturer's standard product consisting of **5-oz./sq. ft. (1.5-kg/sq. m)** sheet copper coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
- B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Asphalt-Coated Copper Flashing:
 - a. Cop-R-Cote; Advanced Building Products, Inc.
 - b. Cop-A-Cote; AFCO Products, Inc.
 - c. Or equal.

2.12 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
 - 1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep holes: Provide open head joint at 24" o.c..
- E. Cavity Drainage Material: **1-inch- (25-mm-)** thick, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.

2.13 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: Rigid, cellular, polystyrene thermal insulation with closed cells and integral high-density skin; formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.14 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
 - a. Cleaners for Brick Subject to Metallic Staining:
 - 1) 202V Vana-Stop; Diedrich Technologies, Inc.
 - 2) Sure Klean Vana Trol; ProSoCo, Inc.
 - 3) Or Equal.

2.15 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602.
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.

2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
3. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 1. With full mortar coverage on horizontal and vertical face shells.
 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
 1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch (19 mm) or more in width.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 BONDING OF MULTI-WYTHE MASONRY

- A. Use masonry joint reinforcement installed in horizontal mortar joints to bond wythes together.
- B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.
 1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.
- C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 1. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

3.7 CAVITIES

- A. Keep cavities clean of mortar droppings and other materials during construction.

1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.
 2. Provide temporary opening by omitting 1 brick every 48 inches (1200 mm) at bottom of cavity and in first course above flashing. After wall has been built to top of cavity and mortar has set, clean out cavity and then close temporary opening.
- B. Coat cavity face of backup wythe to comply with Division 7 Section "Bituminous Dampproofing."
- C. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.8 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
1. Space reinforcement not more than 16 inches (406 mm) o.c.
 2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.
 - a. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
1. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
 2. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition

movement. In no case should control joints exceed 20' 0" o.c. in all interior and exterior masonry walls.

- B. Form control joints in concrete masonry as follows:
 - 1. Install preformed control-joint gaskets designed to fit standard sash block.
- C. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
 - 1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
- C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
 - 1. At multiwythe masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of **8 inches (200 mm)**, and through inner wythe to within 1/2 inch (13 mm) of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (50 mm), unless otherwise indicated.
 - 2. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches (200 mm), and behind air-infiltration barrier or building paper.

3. At lintels and shelf angles, extend flashing a minimum of 4 inches (100 mm) into masonry at each end. At heads and sills, extend flashing 4 inches (100 mm) at ends and turn flashing up not less than 2 inches (50 mm) to form a pan.
 4. **Extend through wall flashing minimum 1 inch past face of brick veneer. Trim flashing flush with brick after visual inspection by NAFI.**
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
1. Use open head joints to form weep holes.
 2. Space weep holes 24 inches (600 mm) o.c.
 3. Place cavity drainage material immediately above flashing 12" high.

3.13 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain NAFI's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.15 MASONRY WASTE DISPOSAL

- A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 04810

DIVISION 5 - METALS

05120 STRUCTURAL STEEL
05500 METAL FABRICATIONS
05810 EXPANSION JOINT COVER ASSEMBLIES

SECTION 05120 - STRUCTURAL STEEL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Structural steel support members.
- B. Struts, columns, and base plates.
- C. Expansion joint plates and structural members.

1.2 RELATED SECTIONS

- A. DIVISION 3 - CONCRETE.
- B. DIVISION 4 - MASONRY.
- C. Section 09900 - PAINTING.

1.3 REFERENCE STANDARDS

- A. Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work in this section where cited below:
 - 1. ASTM - American Society for Testing and Materials.
 - a. A36 - Structural Steel.
 - b. A325 - High-Strength Bolts for Structural Steel Joints.
 - c. A490 - Heat-treated Steel Structure Bolts, 150 ksi minimum tensile strength.
 - d. A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - e. A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - f. A572 - High Strength Low Alloy Columbium-Vanadium Steel of Structural Quality.
 - 2. AWS - American Welding Society.
 - a. D1.1 - Structural Welding Code.
 - 3. AISC - American Institute of Steel Construction.
 - a. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
 - 4. FS - Federal Specification.
 - a. TT-P-86E, Type I - Paint, Oil, Iron Oxide, Ready Mix, Red and Brown.
 - 5. SSPC - Steel Structures Painting Council.

1.4 QUALITY ASSURANCE

- A. Steel Fabricator's Qualifications: Fabricator shall have had not less than five years' experience in fabrication of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel, and completed projects.

- B. Steel Erector's Qualifications: Erector shall have had not less than five years' experience in erection of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel, and completed projects.
- C. Welding Qualifications: Welding procedures, welders, welding operations, and tackers shall be qualified in accordance with AWS D1.1.
 - 1. Welders who have not performed welding for a period of three or more months shall be requalified.
 - 2. Welders whose work fails to pass inspection shall be requalified before performing further welding.
 - 3. This section shall pay costs of certifying qualifications.
- D. Allowable Tolerances:
 - 1. Straightness of structural members:
 - a. Members: Meet requirements of AISC Section 1.23.8.1.
 - b. Architecturally exposed members: Conform with AISC.
 - c. Erection Tolerances: Meet requirements of AISC.

1.5 SUBMITTALS

- A. Manufacturer's literature describing products.
- B. Shop Drawings: Show details including cuts, copes, connections, holes, threaded fasteners, rivets, and welds in the accordance with AWS A2.0. (See General Conditions).
 - 1. All required shop drawings shall be prepared under the seal of a professional structural engineer registered in the state that the structure is to be built.
- C. Erection Procedure: Submit descriptive data to illustrate structural steel erection procedure, including sequence of erection and temporary staging and bracing.
- D. Welding:
 - 1. Certification of welder's qualifications.
 - 2. Welding procedure: submit descriptive data to illustrate welding procedures to be performed.
 - 3. Field welding equipment: submit descriptive data for field welding equipment including type, voltage, and amperage.
- E. Proofs of Compliance for Materials:
 - 1. Certification that materials meet requirements specified.
 - 2. Certified reports of ladle analysis for all steel.
 - 3. Certified reports of tensile, elongation, and bend tests.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.
- B. Discharge materials carefully; do not dump onto ground.
- C. Store structural steel members, whether on or off site, above ground on platforms, skids, or other support; store other materials in weathertight, dry place until time of use.

1.7 JOB CONDITIONS

- A. Provide the NAFI with free access to places whether on or off the jobsite where materials are stored or fabricated, to places where equipment is stored or serviced, and to jobsite during time of laying out, erection, or jobsite fabrication.
- B. Sequencing, Scheduling:
 - 1. Notify the NAFI in sufficient time prior to shop or field fabrication or erection to permit testing and inspection without delaying work.
 - 2. Insure timely delivery of items to be embedded in work of other sections such as cast-in-place concrete; furnish setting drawings or templates and directions for installation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Structural Steel Members: ASTM A36.
- B. Structural Tubing: ASTM A500 or ASTM A501, Grade B (Fy=46KSI).
- C. Bolts, Nuts, and Washers: ASTM A325.
 - 1. Plain washers: ANSI B18.22.1, Type A.
- D. Shear Connectors: Size as shown, meet requirements of AWS D1.1. Same as the Nelson Stud Welding Company's "Nelson Stud"; or approved.
- E. Anchor Bolts: GR50 (Fy=50KSI) or ASTM A36, Grade 36.
- F. High Strength Structural Bolts Including Suitable Nuts and Washers: ASTM A325.
- G. Welding Electrodes: E70XX.
- H. Primer: Alkyd modified oil base Tnemec Company, Inc.'s "10-99 Primer"; or as approved.

2.2 FABRICATION

- A. General Requirements:
 - 1. Fabricate structural steel in accordance with AISC and requirements of regulatory agencies.
 - 2. Fabricate and preassemble work in shop to greatest extent possible.
 - 3. Do shearing, flame cutting, and chipping carefully and accurately.
 - 4. Mill column splices and similar compression joints which depend on contact bearing.
 - 5. Do not drift to match unfair holes. Where enlarging is required, ream and use larger bolt. Misaligned holes will subject members to rejection.
 - 6. Coordinate as required for attachment of other work to structural steel.
 - 7. Drill or punch holes for passage of reinforcing steel through steel shapes, sections, plates, or bars.
- B. Connections:
 - 1. Shop connections: bolted or welded as noted.

2. Field connections:
 - a. Locate field splices only where noted or approved by the Architect.
 - b. Do not locate combination of welds or bolts on same side of connection.
 - c. Where connection is not shown, design in accordance with standard practices unless otherwise directed by the NAFI.
 - d. Mark completely tightened bolts with identifying symbol.
- C. Bolted Connections:
 1. Punch or drill holes 1/16 inch larger than bolt size and spear-ream before inserting bolts.
 2. Ream unfair holes, but only up to next larger bolt size. Where unfairness exceeds maximum, weld hole in base material solid and drill hole of proper size.
 3. As erection progresses, bolt up work to take care of dead load, lateral forces, and erection stresses.
- D. Assembly of High Strength Bolted Construction:
 1. Tighten in accordance with method described in the specifications for structural joists using ASTM A325 or A490 bolts.
 2. Hardened washers: provide under torqued head or nut of high strength bolts.
- E. Assembly with Standard Threaded Fasteners:
 1. Beveled washers: provide under bolt heads or nuts resting on surfaces exceeding 5 percent slope with respect to head or nut.
 2. Draw up tight, check threads with chisel or provide approved lock washers or self-tightening nuts.
- F. Welded Construction:
 1. Weld in accordance with AISC using manual shielded arc method in accordance with AWS D1.1.
 2. Butt-welds:
 - a. Provide full penetration welds.
 - b. If welded from one side, use back-up plates.
 - c. If welded from both sides, back-scarf and clean root weld before depositing weld metal from second side.
 - d. Preheat for minimum 3 inches on each side of welds; maintain interpass temperatures in accordance with AWS D1.1.
 - e. If back up plates are used, remove prior to sonic testing.
 3. Stress-relieve welded assemblies by heat treatment.
 4. Grind exposed welds reasonably smooth.
 5. Acceptable welds:
 - a. Cracks, porosity, or fusion defects as defined in AWS D1.1 greater than $\frac{1}{3} T$ in $3 T$ (where T equals thickness of material) will not be permitted.
 - b. Where material welded displays varying thicknesses, T shall be defined by average of thickness of thinnest piece.
 - c. Defects smaller than $\frac{1}{3} T$ in $3 T$ will be permitted if total accumulated length of defects is not more than $\frac{1}{3} T$ in $3 T$.
- G. Column Bases: Mill and attach to columns.
- H. Bearing Plates: Provide for attached or unattached installation under beams and girders resting on footings, piers, and walls.

2.3 FINISHES

- A. Preparation of Surfaces:
 - 1. Thoroughly clean mill scale, rust, dirt, grease, and other foreign matter from steel prior to painting.
 - 2. Where hand cleaning methods are not adequate, clean in accordance with SSPC-SP 7-63 as required by paint manufacturer.
- B. Painting:
 - 1. Apply one coat of primer to all structural steel surfaces unless otherwise noted.
 - 2. Apply primer in accordance with manufacturer's specifications to provide minimum dry film thickness of 2.0 mils DFT per coat.
 - 3. Permit thorough drying before shipment.
- C. Do not Paint Following Surfaces:
 - 1. Surfaces to be encased in concrete except initial 2 inches.
 - 2. Surfaces to contact high-strength friction bolt connections.
 - 3. Surfaces to be field welded.
 - 4. Surfaces to be concealed by interior finishes except finish painting.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine foundations and footings to support construction and verify following:
 - 1. Correct location and elevation of bearings and anchor bolts.
 - 2. Absence of other conditions to adversely affect erection of steel.
- B. Do not begin erection before unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Supervise setting anchor bolts and other embedded items required for erection of structural steel. Be responsible for correct bearing of steel and correct location of anchor bolts.

3.3 ERECTION

- A. General Requirements:
 - 1. Erect structural steel in accordance with AISC.
 - 2. Insure steel is plumb, level, and in accurate alignment before making final connections.
 - 3. Where erection requires performing work of fabrication on site, conform to applicable standards of Fabrication Article.
 - 4. Field corrections of major members will not be permitted without the NAFI's prior approval.
- B. Column Bases and Bearing Plates:
 - 1. Attached column bases and bearing plates: align with wedges or shims.
 - 2. Loose column bases and bearing plates: set with wedges, and shim.
 - 3. Grouting: grout in accordance with requirements of the manufacturer.
- C. Field Assembly:

1. Clean bearing surfaces and surfaces to be in permanent contact before assembling members.
 2. Accurately assemble frames to lines and elevations indicated, within erection tolerances noted.
 3. Insure assembly is plumb, level, and aligned before final connecting.
 4. Do not fasten splices of compression members before abutting surfaces have been brought completely into contact.
- D. Gas Cutting: Use of flame cutting torch will be permitted only after the NAFI's prior approval and only where metal cut will not carry stress during cutting, stresses will not be transmitted through flame-cut surface and cut surfaces will be visible in finished work.
1. Make cuts smooth and regular in contour.
 2. To determine effective width of members so cut, deduct 1/8 inch from least width at cut edge.
 3. Make radius or re-entrance of cut fillet as large as practical, but in no case less than one inch.
 4. Do not use flame cutting torch to align bolt holes.
- E. Field Touch-Up Painting: After erection, touch-up or paint field connections and abrasions in shop paint with same paint used for shop painting.
- 3.4 CLEANING
- A. After erection, thoroughly clean surfaces of foreign or deleterious matter such as dirt, mud, oil, or grease that would impair bonding of fireproofing or concrete.
- 3.5 FIELD QUALITY CONTROL
- A. The Contractor Quality Control Person Will:
1. Continuously inspect all welding.
 2. Inspect bolted connections as determined by the NAFI.
 3. Inspect erected structural steel as required to establish conformity of work with requirements.
 4. Perform testing and inspection of shear connectors in accordance with requirements of AWS D1.1.

END OF SECTION

SECTION 05500 METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 1. Loose bearing and leveling plates.
 2. Loose steel lintels.
 3. Shelf angles.
 4. Steel framing and supports for mechanical and electrical equipment.
 5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 6. Metal angle corner guards.
 7. Miscellaneous metal trim.
 8. Structural-steel door frames.
- B. Related Sections include the following:
 1. Division 5 Section "Structural Steel" for structural-steel framing system components.
 2. Division 6 Section "Rough Carpentry" for metal framing anchors and other rough hardware.

1.3 SUBMITTALS

- A. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 1. Provide templates for anchors and bolts specified for installation under other Sections.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.5 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- D. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- E. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FASTENERS

- A. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- B. Anchor Bolts: ASTM F 1554, Grade 36.
- C. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- D. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- E. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- F. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
- G. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
- I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Shear and punch metals cleanly and accurately. Remove burrs.
- C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
 - G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
 - H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 - I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
 - J. Remove sharp or rough areas on exposed traffic surfaces.
 - K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- 2.7 LOOSE BEARING AND LEVELING PLATES
- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- 2.8 LOOSE STEEL LINTELS
- A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
 - B. Weld adjoining members together to form a single unit where indicated.
 - C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.
- 2.9 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.
- C. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. General: Provide steel framing and supports indicated and as necessary to complete the Work.
- C. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
 - 3. Furnish inserts if units must be installed after concrete is placed.
- D. Fabricate supports for operable partitions as follows:
 - 1. Beams: Continuous steel shapes of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

2.11 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

2.12 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.14 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Bright, Directional Polish: No. 4 finish.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.15 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- G. Trench Covers: Aluminum frame and covers with recess for vinyl tile inlay. System shall be equal or Balco Metalines – type TST/ACT – 12" by length required.

3.2 SETTING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified above for setting and grouting bearing and leveling plates.
 1. Do not grout baseplates of columns supporting steel girders until girders are installed and leveled.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05810 EXPANSION JOINT COVER ASSEMBLIES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wall expansion joint cover assemblies.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 3 Section "Cast-In-Place Concrete" for cast-in anchorage and frames for expansion joints cover assemblies in concrete floors, parking decks, and walls.
 - 2. Division 7 Section "Flashing and Sheet Metal" for sheet metal roof and wall expansion joint systems.
 - 3. Division 7 Section "Roof Accessories" for curb-type expansion joints.
 - 4. Division 7 Section "Joint Sealants" for elastomeric sealants and preformed foam sealants without metal frames.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of expansion joint cover assembly specified, including manufacturer's product specifications, installation instructions, details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings showing fabrication and installation of expansion joint cover assembly including plans, elevations, sections, details of components, joints, splices, and attachments to other units of Work.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain expansion joint cover assemblies specified in this Section from one source from a single manufacturer. Coordinate compatibility with expansion joint cover assemblies specified in other sections.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the products specified in each Expansion Joint Cover Assemblies Product Data Sheet at end of this Section.

2.2 MATERIALS

- A. Aluminum: ASTM B 221 (ASTM B 221M), alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), alloy 6061-T6, sheet and plate.
 - 1. Protect aluminum surfaces to be placed in contact with cementitious materials with a protective coating.
- B. Preformed Sealant: Manufacturer's standard elastomeric sealant complying with ASTM C 920, Use T, factory-formed and -bonded to metal frames or anchor members; in color indicated or, if not indicated, as selected by NAFI from manufacturer's standard colors.
 - 1. Joints 2 Inches (50 mm) Wide and Less: Withstand plus or minus 35 percent movement of the joint width without failure.
 - 2. Joints Greater Than 2 Inches (50 mm) to 4 Inches (100 mm) Wide: Withstand plus or minus 50 percent movement of the joint width without failure.
- C. Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesive, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 EXPANSION JOINT COVER ASSEMBLIES

- A. General: Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated. Provide units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and dynamic structural movement without material degradation or fatigue when tested according to ASTM E 1399. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.
- B. Moisture Barrier: Provide manufacturer's continuous, standard, flexible vinyl moisture barrier under covers at locations indicated.
- C. Metal Floor-to-Floor Joint Cover Assemblies: Provide continuous extruded metal frames of profile indicated with seating surface and raised floor rim or exposed trim strip to accommodate flooring and concealed bolt and anchors embedded in concrete. Provide assemblies formed to receive cover plates of design indicated and to receive filler materials (if any) between raised rim of frame and edge of plate. Furnish depth and configuration to suit type of construction and to produce a continuous flush wearing surface with adjoining finish floor surface. Equal to C/S expansion – GFS – 100/200.
- D. Floor-to-Wall Joints: Provide one frame on floor side of joint only. Provide wall side frame where required by manufacturer's design. Equal to C/S expansion GFSW – 100/200.

- E. Wall-to-Wall: C/S #SM-1N for surface mounted aluminum cover over 1" joints.
- F. Floor to Floor: Extruded aluminum plate cover equal to C/S #PC.
- G. Floor to Wall: Extruded formed aluminum angle cover equal to C/S #PCW.

2.4 METAL FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes to products in factory after fabrication. Protect finishes on exposed surfaces before shipment.
- B. Aluminum Finishes: Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
 - 1. Class II, Clear-Anodized Finish: AA-M12C22A31 [Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II architectural, clear film thicker than 0.4 mil (0.01 mm)].
 - 2. Wall Joints: Provide rod and sealant for all interior and exterior wall joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Manufacturer's Instructions: In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for phases of Work, including preparing substrate, applying materials, and protecting installed units.
- B. Coordinate and furnish anchorages, setting drawings, templates, and instructions for installation of expansion joint cover assemblies to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.
- C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

3.2 INSTALLATION

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required to install expansion joint covers. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling. Set floor covers at elevations to be flush with adjacent finished floor materials. Locate wall, ceiling, roof, and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with required accessories. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) on center.

- B. Continuity: Maintain continuity of expansion joint cover assemblies with a minimum number of end joints and align metal members mechanically using splice joints. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials (if any) to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- C. Elastomeric Sealant Joint Assemblies: Seal end joints within continuous runs and joints at transitions according to manufacturer's directions to provide a watertight installation.

3.3 CLEANING AND PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

END OF SECTION 05810

DIVISION 6 - WOOD AND PLASTICS

- 06100 ROUGH CARPENTRY
- 06112 FRAMING AND SHEATHING
- 06181 GLUE LAMINATED STRUCTURAL UNITS
- 06193 PLATE CONNECTED WOOD TRUSSES
- 06200 FINISH CARPENTRY
- 06402 INTERIOR ARCHITECTURAL WOODWORK

SECTION 06100 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Blocking, backing, stripping, and nailers.
- B. Preservative treatment.
- C. Concealed wood blocking.

1.2 RELATED SECTIONS

- A. Section 06200 - FINISH CARPENTRY.
- B. DIVISION 7 - THERMAL AND MOISTURE PROTECTION.
- C. DIVISION 16 - ELECTRICAL.

1.3 QUALITY ASSURANCE

- A. Lumber: Identify with grade stamp of an agency certified by American Lumber Standard Committee.
- B. Fire retardant treatment to conform to requirements of Underwriters Laboratories.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Pressure treated lumber for all plates, curbs, and other treated members as indicated shall provide protection against rot, decay, and termites. Lumber shall be No. 2 Yellow Pine or No. 2 Douglas Fir, and shall be treated with Water-borne preservatives complying with AWPB LP-2. All cuts, planed surfaces, bored holes, etc., shall be treated at the job site by dipping or liberal brushing with the same material.
- B. Wood grounds on the interior shall be No. 2 Yellow Pine, or No. 2 Fir, S4S, grade marked, and dressed to mill size and treated.
- C. Framing and structural lumber shall be No. 2 dimension 1,200 "f" Southern Pine, S4S, dressed to mill size, or as otherwise specified or indicated.
- D. Interior plywood shall be APA A-D group 1 interior PS 1-74.
- E. Exterior plywood shall be APA A-C group 1 exterior PS 1-74.

2.2 ACCESSORIES

- A. Bolts, nuts, lag screws, nails, and wood screws shall conform to Federal Specifications FF-B-571, FF-P-561, and FF-S-111, as applicable.

PART 3 EXECUTION

3.1 PREPARATION

- A. Treated Wood Plates and Curbs and Grounds on Exterior: Wood plates, curbs, and guards shall be bolted or lag screwed in place, as indicated. These plates shall be in lengths as long as is practicable to handle. Provide washers for all anchor bolts.
- B. Blocking and Grounds: Provide blocking and grounds as required, and secure these to structure with expansion anchors on 3'-0" centers.

END OF SECTION

SECTION 06112 - FRAMING AND SHEATHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Structural, Floor, Walls, and Roof Framing.
- B. Build-up Structural Beams and Columns.
- C. Diaphragm Trusses Built on Site.
- D. Wall and Roof Sheathing.
- E. Preservative Treatment of Wood.
- F. Insulating Sheathing.

1.2 RELATED SECTIONS

- A. Section 03300 - CAST-IN-PLACE CONCRETE.
- B. Section 05120 - STRUCTURAL STEEL.
- C. Section 06193 - PLATE CONNECTED WOOD TRUSSES.
- D. DIVISION 8 - DOORS AND WINDOWS.
- E. Section 09255 - GYPSUM WALLBOARD ASSEMBLIES.

1.3 REFERENCES

- A. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.
- B. ANSI A135.4 - Basic Hardwood.
- C. APA - American Plywood Association.
- D. AWWA - American Wood Preservers' Association: Book of Standards.
- E. FS - TT-W-571 - Wood Preservation: Treating Practices.
- F. NFPA - National Forest Products Association.
- G. RIS - Redwood Inspection Service: Standard Specifications for Grades of California Redwood Lumber.
- H. SFPA - Southern Forest Products Association.
- I. WCLIB - West Coast Lumber Inspection Bureau: Standard Grading Rules for West Coast Lumber.

- J. WWPA - Western Wood Products Association.

1.4 QUALITY ASSURANCE

- A. Lumber Grading Agency: Certified by ALSC.
- B. Plywood Grading Agency: Certified by APA.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire retardant requirements.
- B. Conform to UL requirements to achieve rating indicated.

1.6 SUBMITTALS

- A. Submit product data for approval.
- B. Provide technical data on wood preservative materials and application instructions.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.
- B. Discharge materials carefully; do not dump onto ground.
- C. Store all materials whether on or off site, above ground on platforms, skids, or (other support), store other materials in weathertight, dry place until time of use.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

- A. Lumber Grading Rules: NFPA, RIS, SFPA, WCLIB, WWPA.
- B. Beam Framing: any species, structural grade, 19 percent maximum moisture content.
- C. Joist Framing: any species, structural grade, 19 percent maximum moisture content.
- D. Non-structural Light Framing: any species, construction grade, 19 percent maximum moisture content.

2.2 PLYWOOD MATERIALS

- A. Roof Sheathing: APA Structural I, Grade C-D; unsanded.
- B. Wall Sheathing: APA Structural I, Grade C-D; unsanded.

2.3 HARD BOARD MATERIALS

- A. Underlayment: ANSI A208.1; pressed wood fiber with resin binder; standard, tempered,

service, tempered service grade.

2.4 INSULATING SHEATHING

- A. Isocyanurate Plastic Board Sheathing: Rigid closed-cell isocyanurate sheathing panels consisting of glass-fiber reinforced polyisocyanurate foam plastic core between protective aluminum foil facings with an aged k-value of 0.14; min. 20 psi compressive strength; 1.5% max. water absorption; in manufacturer's standard lengths and widths with square edges and thicknesses indicated.
 - 1. Products: Subject to a compliance with requirements, provide one of the following:
 - a. "High-R Sheathing" by Owens Corning Fiberglas Corp.
 - b. "Thermax Sheathing" by Celotex Corp.
 - c. "Thermatite" by Johns-Manville.

2.5 ACCESSORIES

- A. Fasteners: Electro or Hot-dipped galvanized steel for exterior, high humidity, and treated wood locations; plain finish elsewhere; size and type to suit condition.
- B. Connectors: As indicated.
- C. Joist Hangers: Galvanized steel, sized to suit joists and framing conditions; as recommended by manufacturer or indicated.
- D. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolts or ballistic fasteners for anchorage to steel.
- E. Building Paper: No. 15 asphalt felt.

2.6 WOOD TREATMENT

- A. Fire Retardant: Chemically treated and pressure impregnated; capable of providing a maximum flame spread of 25.
- B. Wood Preservative Pressure Treatment: FS TT-W-571 or AWWPA Treatment C2 using waterborne preservative with 0.30 percent retainage.
- C. Wood Preservative (Surface Application): Clear, waterborne type; as recommended by manufacturer.

PART 3 EXECUTION

3.1 SITE APPLIED WOOD TREATMENT

- A. Brush apply two coats of preservative treatment on wood in contact with cementitious materials.
- B. Apply preservative treatment in accordance with manufacturer's instructions.
- C. Treat site-sawn ends.

- D. Allow preservative to cure prior to erecting members.

3.2 FRAMING

- A. Erect wood framing members level and plumb.
- B. Place horizontal members laid flat, crown side-up.
- C. Construct framing members full length without splices.
- D. Double members at openings over one sq. ft. (0.1 sq. m.). Space short studs over and under opening to stud spacing.
- E. Construct double joist under wall studding.
- F. Bridge joists and framing in excess of 8 feet 2.3 m span at mid-span members. Fit solid blocking at ends of members.
- G. Coordinate installation of wood decking, wood chord metal joists, prefabricated wood trusses and plywood web joists.

3.3 SHEATHING

- A. Secure roof sheathing Perpendicular to framing members with ends staggered. Secure sheet edges over firm bearing. Use sheathing clips between sheets between roof framing members.
- B. Secure wall sheathing horizontally perpendicular to wall studs, with ends staggered, over firm bearing.
- C. Place plywood sheathing at building corners where insulated sheathing is being used.
- D. Place building paper over wall sheathing; weatherlap joints.
- E. Install plywood to two span continuous.

3.4 TOLERANCES

- A. Framing Members: 1/4 inch 5mm maximum from true position.

END OF SECTION

SECTION 06181 - GLUE LAMINATED STRUCTURAL UNITS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Glue laminated wood beams and roof structure.
- B. Preservative treatment of wood.
- C. Attachment and bearing systems.

1.2 RELATED SECTIONS

- A. DIVISION 3 - CONCRETE.
- B. DIVISION 4 - MASONRY.
- C. DIVISION 5 - METALS.
- D. DIVISION 6 - WOOD AND PLASTICS.
- E. Section 06112 - FRAMING AND SHEATHING.
- F. DIVISION 7 - THERMAL AND MOISTURE PROTECTION.
- G. DIVISION 9 - FINISHES.
- H. DIVISION 15 - MECHANICAL.
- I. DIVISION 16 - ELECTRICAL.

1.3 REFERENCES

- A. American Institute of Timber Construction - AITC 117 - "DESIGN, Standard Specifications for Structural Glued Laminated Timber of Softwood Species".
- B. U.S. Department of Commerce/National Bureau of Standards - Voluntary Product Standard 56 "Structural Glued Laminated Timber".
- C. National Forest Products Association "National Design Specification for Wood Construction".
- D. AITC - American Institute of Timber Construction.
- E. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.
- F. ANSI A190.1 - Structural Glued Laminated Timber.
- G. ASTM A36 - Structural Steel.
- H. ASTM A123 - Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.

- I. ASTM A167 - Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet, and Strip.
 - J. ASTM A325 - High Strength Bolts for Structural Steel Joints.
 - K. ASTM D2559 - Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions.
 - L. AWWPA - American Wood Preservers' Association.
- 1.4 SUBMITTALS
- A. Product Data: Submit manufacturer's data, specifications and installation instructions covering lumber, adhesives, fabrication process, preservative treatment, accessories and protection.
 - 1. Submit certification, signed by an officer of the manufacturing firm, indicating glued laminated timbers comply with requirements of PS 56.
 - 2. Submit certification by treating plant that required treatments comply with specified standards.
 - B. Shop Drawings: Submit shop drawings showing full dimensions of each member and layout of entire structural system. Show large scale details of connections, connectors, and other accessories. Indicate species and stress grade of lumber, type of glue, and other variables in required work.
 - 1. To the extent engineering design considerations are specified as manufacturer's responsibility, show loading, section modulus, assumed allowable stress, stress diagrams and calculations, and similar information needed for analysis.
 - 2. Shop drawings to be stamped by a structural engineer licensed to practice in the state where units are fabricated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Keep glued laminated structural units dry during delivery, storage, handling, and erection, by maintaining factory-applied protective covering in weather-tight and light-proof condition, or by applying other weathertight protection. Maintain protective covering until building enclosure is completed to extent necessary for protection of interior work, and until final finishing of exterior work is ready to proceed. Do not store in areas of either excessively high or excessively low relative humidity; comply with manufacturer's instructions.
- B. Time delivery and installation of work to avoid extended on-site storage, and to avoid delaying work of other trades whose work must follow erection of work.

PART 2 PRODUCTS

2.1 GLUED LAMINATED STRUCTURAL UNITS

- A. Lumber: Comply with PS 56 and applicable lumber association standards cited therein for grades required to achieve requirements for allowable stress, appearance, fabrication limitations and species (if any).
 - 1. Preservative Treatment: Where preservative treatment is indicated, pressure treat

lumber prior to gluing, in accordance with AWWA C28. Kiln dry to not more than 19 percent moisture content after treatment, and discard pieces which have bowed, warped, twisted, or checked to extent of causing a detrimental result in work.

2. Stress Values: Provide glued laminated timber members sized as shown on drawings that meet or exceed following stress values:
 - a. Bending (Fc), 2,400 psi.
 - b. Horizontal shear (Fv), 200 psi.
 - c. Compression perpendicular to grain (Fc - tension face), 218 psi.
 - d. Compression parallel to grain (Fc - compression), 1,700 psi.
 - e. Compression perpendicular to grain (Fc - compression face), 650 psi.
 - f. Modulus of elasticity (E), 1,800,000 psi.
3. Lumber Species: Any softwood lumber or mixed species, at manufacturer's option, as required to comply with other requirements.
4. Adhesive: Comply with PS 56, using wet-use (waterproof) adhesive, unless otherwise indicated.
5. End Sealer: Manufacturer's standard transparent, colorless wood sealer, effective in retarding transmission of moisture at cross-grain cuts.
6. Penetrating Sealer: Manufacturer's standard translucent penetrating wood sealer, which will not interfere with application of wood stain and transparent finish, or paint finish, as indicated. Refer to DIVISION 9 sections for required finishes.
7. Connectors, Anchors, Accessories: Provide fabricated steel (ANSI/ASTM A 36) shapes, plates, and bars, welded into assemblies of types and sizes indicated or, if not indicated, manufacturer's standard units for timber sizes indicated, with steel bolts (ANSI/ASTM A 307), lag bolts (FSS FF-B-561), nails (FS FF-N-105), and other standard fasteners as required.

2.2 FABRICATION

- A. General: Comply with PS 56 in providing units indicated; where dimensions are not completely documented, provide manufacturer's standard sizes and shapes required to fulfill indicated performances.
- B. Appearance Grade: Provide industrial Grade timbers, complying with AITC 110.
 1. Face species: Douglas Fir/Larch.
 2. Face Grade: Decorative/Architectural.
 3. Face Surface: Smooth.
 4. Pattern: Edge Vee.
- C. Preservative Treatment: Laminate members from preservative treated lumber. After dressing and end-cutting each member to final size and shape, apply a heavy brush coat of same (or compatible) treatment (in a light petroleum solvent) to cut surfaces (wherever cut to a depth of more than 1/16 inch).
- D. End-Cut Sealing: Immediately after end-cutting each member to final length, and after wood treatment (if any), apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces "flood-coated" for not less than 10 minutes.
- E. Factory Applied Protection: Before shipping or exposing to outdoor conditions, individually wrap each member with manufacturer's standard, opaque, durable, water-resistant, plastic-coated paper covering, with water-resistant seams.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General: Comply with AITC 108 "Standard for Heavy Timber Construction" and manufacturer's instructions.
 - 1. Install miscellaneous connectors, anchors, and accessories as indicated.
 - 2. Cutting: Avoid cutting members during erection, to greatest extent possible. Except for fastener drilling and other minor cutting, coat cuts with end sealer as specified for "Fabrication".
 - a. Where treated members must be cut during erection, apply a heavy brush coat of the same treatment, complying with AWP Standard M4.
 - 3. Handle and temporarily support members to prevent visible surface damage.
 - 4. Do not remove wrapping on individually wrapped members until it will serve no useful purpose, including protection from weather, soiling and damage from work of other trades. Coordinate removal of wrapping with finishing work specified in the DIVISION 9 sections. Retain wrapping wherever it can serve as a painting shield.
 - 5. Maintain expansion spaces as shown, and as required by applicable AITC standards, and as recommended by decking manufacturer.
- B. Install glued laminated decking with a bead of structural joint adhesive in each joint as recommended by manufacturer. Install in manner certified by manufacturer to qualify deck construction for diaphragm action, as required by governing regulations and industry standards.
 - 1. Secure decking as indicated, or if not otherwise indicated, comply with manufacturer's instructions and with AITC recommendations for wood decking. Comply with governing regulations.
 - 2. Repair damaged surfaces and finishes after completion of erection and removal of wrappings, or replace damaged members as directed where damage is beyond satisfactory repair.

3.2 PROTECTION

- A. Advise Contractor of necessary limitations on heating, ventilating and air conditioning in building, in order to avoid damage or deterioration of work.

END OF SECTION

SECTION 06193 - PLATE CONNECTED WOOD TRUSSES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Prefabricated wood trusses for roof framing.
- B. Bridging, bracing, and anchorage.
- C. Barring Plates or connection straps.

1.2 RELATED SECTIONS

- A. Section 04810 – UNIT MASONRY ASSEMBLIES.
- B. Section 06100 - ROUGH CARPENTRY.
- C. Section 06112 - FRAMING AND SHEATHING.
- D. Section 06200 - FINISH CARPENTRY.
- E. DIVISION 7 - THERMAL AND MOISTURE PROTECTION.
- F. Section 07210 - BUILDING INSULATION.
- G. Section 09255 - GYPSUM WALLBOARD ASSEMBLIES.
- H. DIVISION 15 - MECHANICAL.
- I. DIVISION 16 - ELECTRICAL.

1.3 REFERENCES

- A. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.
- B. ASTM A167 - Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- C. ANSI/ASTM A446 - Sheet Steel, Zinc Coated (Galvanized) by the Hot-Dip Process, Physical (Structural) Quality.
- D. AWP - American Wood Preservers' Association.
- E. FS TT-W-571 - Wood Preservation: Treating Practices.
- F. NFPA - National Forest Products Association.
- G. RIS - Redwood Inspection Service: Standard Specifications and Grades for California Redwood Lumber.
- H. SFPA - Southern Forest Products Association.

- I. TPI - Truss Plate Institute.
- J. UL - Underwriters' Laboratories, Inc.
- K. WCLIB - West Coast Lumber Inspection Bureau: Standard Grading Rules for West Coast Lumber.
- L. WWPA - Western Wood Products Association.

1.4 SYSTEM DESCRIPTION

- A. Design roof Live and Dead Load as indicated on drawings with deflection limited to 1/360.
- B. Fire Resistance Rating: Roof assemble rating only if indicated on drawings.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacture of prefabricated wood trusses with three years minimum experience.
- B. Design trusses under direct supervision of Professional Engineer experienced in structural framing design of trusses registered in the state where this work is being done.
- C. Lumber Grading Agency: Certified by ALSC.
- D. Truss Plates: In accordance with Truss Plate Institute.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for loads and other governing load criteria.
- B. Conform to applicable code for fire retardant where required and indicated on drawings.

1.7 SUBMITTALS

- A. Submit shop drawings for approval.
- B. Indicate framing system, sizes and spacing of joists, loads and joist cambers, bearing and anchor details, bridging and bracing, framed openings, and submit design calculations if requested.
- C. Provide technical data on wood preservative materials if required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in bundles and up off ground at least 4 inches.
- B. Store and protect products as recommended by manufacturer.
- C. Transport and store trusses in vertical position resting on bearing ends.

- D. Protect trusses from moisture, warpage, and distortion during transit and when stored.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Lumber Grading Rules: NFPA, WWP.
- B. Plywood Gussets: Graded by APA; FIR species wood, waterproof glue; 19 percent maximum moisture content.
- C. Steel Connectors: ANSI/ASTM A446 steel, Grade A or B, galvanized; die stamped with integral teeth or, of manufacturers standard approved connectors.
- D. Fasteners: Galvanized for exterior, high humidity, and treated wood locations; plain finish elsewhere; size and type to suit condition.
- E. Bearing Plate Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to hold masonry or concrete. Bolts or ballistic fasteners for anchorages to steel.
- F. Wood Blocking, Plating, Framing for Openings: In accordance with Section 06100.

2.2 WOOD TREATMENT (WHERE INDICATED ON DRAWINGS)

- A. Fire-Retardant Treatment: Where fire-retardant treated lumber is required for trusses, provide treatment by pressure process complying with AWP C20 and identify treated lumber with appropriate classification marking of Underwriters Laboratories, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction. Use a low-hygroscopic fire-retardant treatment suitable for interior applications with relative humidities of 92% or less which is approved by truss plate manufacturer for indicated applications as being non-corrosive to metal plates of material and finish specified.
- B. Wood Preservative Pressure Treatment: AWP Treatment C2 using water borne preservative with 0.30 percent retainage.

2.3 FABRICATION

- A. Verify dimensions and site conditions prior to fabrication.
- B. Cut members accurately to length to achieve tight joint connections.
- C. Jig trusses during fabrication to assure accurate configuration. Press connectors into lumber, both sides of joint simultaneously.
- D. Build camber into truss.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that supports and openings are ready to receive trusses.
- B. Verify sufficient end bearing area.
- C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Coordinate placement of bearing support items

3.3 INSTALLATION

- A. Install trusses in accordance with manufacturer's instructions and approved shop drawings.
- B. Place trusses true to line and level.
- C. Provide temporary bracing to hold trusses in place until permanently secured.
- D. Place permanent bridging, bracing, and anchors to maintain trusses straight and in correct position before inducing loads.
- E. Do not field cut trusses.
- F. Place headers and supports to frame openings required.
- G. Frame openings between trusses with lumber in accordance with Section 06100.
- H. Coordinate placement of sheathing with work of this Section.

3.4 TOLERANCES

- A. Framing Members: 1/2 inch 13 mm maximum from true position.

END OF SECTION

SECTION 06200 FINISH CARPENTRY**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior standing and running trim.
 - 2. Interior standing and running trim.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Division 6 Section "Rough Carpentry" for structural wood decking and framing exposed to view.
 - 3. Division 6 Section "Interior Architectural Woodwork" for interior woodwork not specified in this Section.
 - 4. Division 9 Section "Painting" for priming and back priming of finish carpentry.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of factory-fabricated product and process specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
- B. Do not deliver interior finish carpentry until environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels through the remainder of construction period.
- B. Weather Limitations: Proceed with installing exterior finish carpentry only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. NHLA - National Hardwood Lumber Association.
 - 2. NLGA - National Lumber Grades Authority.
 - 3. SPIB - Southern Pine Inspection Bureau.
 - 4. WCLIB - West Coast Lumber Inspection Bureau.
 - 5. WWPA - Western Wood Products Association.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.
- D. Softwood Plywood: Comply with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."
- E. Hardwood Plywood: Comply with HPVA HP-1, "Interim Voluntary Standard for Hardwood and Decorative Plywood."
- F. Hardboard: ANSI/AHA A135.4
- G. Medium-Density Fiberboard: ANSI A208.2, Product Class MD.
- H. Medium-Density Fiberboard: Product made without formaldehyde and complying with ANSI A208.2, Product Class MD.
 - 1. Product: Subject to compliance with requirements, provide "Medite II" by Medite Corp.
- I. Particleboard: ANSI A208.1, Grade M-2.

2.2 EXTERIOR STANDING AND RUNNING TRIM

- A. Lumber Trim: Provide finished lumber and moldings complying with the following requirements including those of the grading agency listed with species:
 - 1. Species: Southern yellow pine; SPIB.
 - a. Grade: B & B.
 - 2. Texture: Surfaced (smooth).
 - 3. Lumber for Transparent Finish (Stained or Clear): Solid lumber stock.
 - 4. Lumber for Painted Finish: Glued-up lumber or solid lumber stock.

2.3 INTERIOR STANDING AND RUNNING TRIM

- A. Softwood Trim: Provide finished lumber and moldings complying with the following requirements including those of the grading agency listed with species:
 - 1. Species: Eastern white pine; NELMA or Idaho white, lodgepole, ponderosa, or sugar pine; WWPA.
 - 2. Species: Douglas fir; NLGA, WCLIB, or WWPA.
 - 3. Grade: B & Btr. Select or Supreme.
 - 4. Texture: Surfaced (smooth).
 - 5. Lumber for Transparent Finish (Stained or Clear): Solid lumber stock.
 - 6. Lumber for Painted Finish: Glued-up lumber or solid lumber stock.
- B. Wood Molding Patterns: Provide stock moldings made to patterns included in WMMPA WM 7 and graded under WMMPA WM 4 – See drawings for shapes.
 - 1. Moldings for Transparent Finish: N-Grade.
 - 2. Moldings for Painted Finish: P-Grade.

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails of the following materials, in sufficient length to penetrate minimum of 1-1/2 inches (38 mm) into substrate, unless otherwise recommended by manufacturer.
 - 1. Hot-dip galvanized steel.
- B. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
 - 1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153.
- C. Paneling Adhesives: Comply with paneling manufacturer's recommendations for adhesives.
- D. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

- E. Flashing: Comply with requirements of Division 7 Section "Sheet Metal Flashing and Trim" for flashing materials installed in finish carpentry.
 - 1. Horizontal Joint Flashing for Siding: Preformed galvanized steel or aluminum Z-shaped flashing.
- F. Sealants: Comply with requirements of Division 7 Section "Joint Sealants" for materials required for sealing siding work.

2.5 FABRICATION

- A. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry on relative humidity conditions existing during time of fabrication and in installation areas.
- B. Fabricate finish carpentry to dimensions, profiles, and details indicated.
 - 1. Back out or kerf backs of the following members, except members with ends exposed in finished work:
 - a. Exterior standing and running trim wider than 5 inches (125 mm).
 - b. Interior standing and running trim, except shoe mold and crown mold.
 - c. Wood board paneling.
 - 2. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius.
 - 3. Ease edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.
- C. Prime and backprime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Division 9 Section "Painting."

3.3 INSTALLATION, GENERAL

- A. Do not use finish carpentry materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
 - 1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
 - 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
 - 4. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
- C. Finish according to specified requirements.
- D. Refer to Division 9 Sections for final finishing of finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, if required.
 - 1. Match color and grain pattern across joints.
 - 2. Install trim after gypsum board joint finishing operations are completed.
 - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
 - 4. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

3.5 ADJUSTING

- A. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

- A. Provide final protection and maintain conditions that ensure finish carpentry is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 06200

SECTION 06402 INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 1. Plastic-laminate cabinets (Melamine)
 2. Plastic-laminate countertops.
- B. Related Sections include the following:
 1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 2. Division 6 Section "Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.
 3. Division 6 Section "Quartz Surfacing Materials" for bar counter top.

1.3 DEFINITIONS

- A. Interior Architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories.
- B. Product Data: For medium-density fiberboard, particleboard, plywood, high-pressure decorative laminate, thermoset decorative overlay, solid-surfacing material, cabinet hardware and accessories.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 1. Show details full size.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 3. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in Architectural woodwork.
- D. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
 1. Shop-applied transparent finishes.

2. Shop-applied opaque finishes.
3. Plastic laminates.
4. Thermoset decorative overlays.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed Architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Fabricator Qualifications: A firm experienced in producing Architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior Architectural woodwork, construction, finishes, and other requirements.
 1. Provide AWI certification labels or compliance certificate indicating that woodwork complies with requirements of grades specified.
- D. Mockups: If requested by NAFI, before fabricating and installing interior Architectural woodwork, build mockups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by NAFI.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and will maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 17 and 50 percent during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior Architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Thermoset Decorative Overlay: Particleboard complying with ANSI A208.1, Grade M-2, or medium-density fiberboard complying with ANSI A208.2, Grade MD, with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Corporation.
 - b. International Paper; Decorative Products Div.
 - c. Laminart.
 - d. Westinghouse Electric Corp.; Specialty Products Div.
 - e. Wilsonart International; Div. of Premark International, Inc.
- D. Adhesive for Bonding Plastic Laminate: contact cement.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with Architectural cabinets,.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening[.
- D. Wire Pulls: Back mounted, 4 inches (100 mm) long, 5/16 inches (8 mm) in diameter.
- E. Shelf Rests: BHMA A156.9, B04013.

- F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
 - 1. Box Drawer Slides: 75 lbf (330 N).
 - 2. File Drawer Slides: 150 lbf (670 N).
 - 3. Pencil Drawer Slides: 45 lbf (200 N).
 - 4. Keyboard Slide: 75 lbf (330 N).
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Grommets for Cable Passage through Countertops: 1-1/4-inch (32-mm) black molded-plastic grommets and matching plastic caps with slot for wire passage. Provide (1) grommet for each 6'-0" linear feet of counter as located by NAFI.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide premium grade interior woodwork complying with the referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Complete fabrication, including assembly, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify NAFI seven days in advance of the dates and times woodwork fabrication will be complete.

2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- D. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 1. Seal edges of openings in countertops with a coat of varnish.

2.5 PLASTIC-LAMINATE CABINETS

- A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.
- B. Quality Standard: Comply with WIC Section 15.
- C. Grade: Premium.
- D. AWI Type of Cabinet Construction: Flush overlay.
- E. Laminate Panels for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 1. Horizontal Surfaces Other Than Tops: Premium grade melamine laminate panels.
 2. Postformed Surfaces: Premium grade melamine laminate panels.
 3. Vertical Surfaces: Premium grade melamine laminate panels..
 4. Edges: 3MM plastic matching laminate in color, pattern, and finish on all door and drawer panels.
- F. Materials for Semiexposed Surfaces: Provide surface materials indicated below:
 1. Surfaces Other Than Drawer Bodies: Thermoset decorative overlay.
 2. Drawer Sides and Backs: Thermoset decorative overlay.
 3. Drawer Bottoms: Thermoset decorative overlay.
- G. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 1. Provide NAFI's selections from laminate manufacturer's full range of colors and finishes in the following categories:
 - a. Solid colors.
 - b. Solid colors with core same color as surface.
 - c. Wood grains.
 - d. Patterns.

2.6 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.

- B. Quality Standard: Comply with WIC Section 16.
- C. Grade: Premium.
- D. High-Pressure Decorative Laminate Grade HGP.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. Provide NAFI's selections from manufacturer's full range of colors and finishes in the following categories:
 - a. Solid colors.
 - b. Solid colors with core same color as surface.
 - c. Wood grains.
 - d. Patterns.
- F. Grain Direction: Parallel to cabinet fronts.
- G. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- H. Core Material: Particleboard made with exterior glue.

2.7 QUARTZ COUNTERTOPS

- A. Quality Standard: Comply with ASTM C615.
- B. Basis of Design
 - 1. Mfr: Cambria
 - 2. Color: Refer to Color Legend on drawings
 - 3. Cut from contiguous matched slabs.
 - 4. Finish: Polished.
 - 5. Match NAFI's samples for color, finish and other characteristics relating to aesthetic effects.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.
- B. Before installing Architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails [or finishing screws] for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 3. Secure backsplashes to walls with adhesive.
 - 4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- G. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06402

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07160	BITUMINOUS DAMPPROOFING
07210	BUILDING INSULATION
07311	ASPHALT SHINGLES
07610	SHEET METAL ROOFING
07620	SHEET METAL FLASHING AND TRIM
07920	JOINT SEALANTS

SECTION 07160 BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 1. Cold-applied, asphalt emulsion dampproofing.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified, including data substantiating that materials comply with requirements for each dampproofing material specified. Include recommended method of application, recommended primer, number of coats, coverage or thickness, and recommended protection course.

1.4 PROJECT CONDITIONS

- A. Substrate: Proceed with dampproofing only after substrate construction and penetrating work have been completed.
- B. Weather Limitations: Proceed with dampproofing only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements.
- C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Cold-Applied, Asphalt Emulsion Dampproofing:
 - a. ChemRex, Inc.; Sonneborn Building Products Div.
 - b. Karnak Chemical Corporation.
 - c. Koppers Industries, Inc.
 - d. Meadows: W.R. Meadows, Inc.

2.2 BITUMINOUS DAMPPROOFING

- A. General: Provide products recommended by manufacturer for designated application.
- B. Cold-Applied, Asphalt Emulsion Dampproofing: Asphalt-based emulsions recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.
- B. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.
- C. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at construction joints.
- D. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details shown and with manufacturer's recommendations. Pay particular attention to requirements at building expansion joints, if any.
- E. Prime substrate as recommended by prime materials manufacturer.
- F. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's recommendations except where more stringent requirements are indicated and where Project conditions require extra precautions to ensure satisfactory performance of work.
- B. Application: Apply dampproofing to the following surfaces.
 - 1. Exterior surface of inside wythe of double-wythe, exterior masonry walls above grade, to prevent water-vapor penetration through the wall.
 - 2. Where indicated on the Drawings.

3.3 COLD-APPLIED, ASPHALT EMULSION DAMPPROOFING

- A. Spray Grade: Brush or spray apply a coat of asphalt emulsion dampproofing at a rate of 1.5 to 2.5 gal./100 sq. ft. (0.6 to 1 L/sq. m), depending on substrate texture, to produce a uniform, dry-film thickness of not less than 15 mils (0.4 mm). Apply in 2 coats, if necessary, to obtain required thickness, allowing time for complete drying between coats.

- B. Do not apply to walls to receive exterior insulation and finish system.

END OF SECTION 07160

SECTION 07210 BUILDING INSULATION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Concealed building insulation.
 - 2. Sound batts.
 - 3. Rigid insulation roof.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of insulation product specified.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:
 - 1. Glass-Fiber Insulation / Sound Batts:
 - a. CertainTeed Corporation.
 - b. Knauf Fiber Glass GmbH.
 - c. Owens-Corning Fiberglas Corporation.
 - d. Schuller International, Inc.
 - e. Atlas Roofing Corporation

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Faced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type III, Class A (blankets with reflective vapor-retarder membrane facing and flame spread of 25 or less); with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face R-13 insulating value.
 - 1. Mineral-Fiber Type: Fibers manufactured from glass.
 - 2. Flanged Units: Provide blankets fabricated with facing along edges for attachment to framing members.
- C. Sound Batts – Glass fiber units equal to Owens Corning Sound Attenuation Insulation.
- D. Roof Insulation: 2-1/2" Rigid crossvent roof insulation.
 - 1. Normal Thickness: 2-1/2" with 1.0" air space.
 - 2. Product shall be equal to Atlas AC Foam Crossvent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

- D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 - 1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. For wood-framed construction with faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.
- E. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
- F. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- G. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.
- H. Install cross ventilating rigid roof insulation in accordance with manufacturers recommendation.
 - 1. Install directly over vapor retarder that has been applied over the deck.
 - 2. Install utilizing manufacturers recommended fasteners.

3.5 PROTECTION

- A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

SECTION 07311 ASPHALT SHINGLES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes asphalt shingles for steep roofs.
- B. Roof accessories.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section "Rough Carpentry" for wood sheathing and framing.
 - 2. Division 7 Section "Flashing and Sheet Metal" for metal valley flashing, step flashing, drip edges, and other sheet metal work.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.
- C. Samples for initial selection in the form of manufacturer's sample finishes showing the full range of colors and profiles available for each type of asphalt shingle indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's unopened bundles or containers with labels intact.
- B. Handle and store materials at Project site to prevent water damage, staining, or other physical damage. Store roll goods on end. Comply with manufacturer's recommendations for job-site storage, handling, and protection.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installing asphalt shingles only when existing and forecasted weather conditions will permit work to be performed according to manufacturers' recommendations and warranty requirements, and when substrate is completely dry.

1.6 WARRANTY

- A. **General Warranty:** The special warranty specified in this Article shall not deprive the NAFI of other rights the NAFI may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. **Special Warranty:** Submit a written warranty signed by manufacturer agreeing to repair or replace asphalt shingles that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, deformation or deterioration of asphalt shingles beyond normal weathering.
 - 1. **Warranty Period:** Manufacturer's standard but not less than 25 years after date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Furnish 1 square (9.29 sq. m) coverage of asphalt shingles, identical to those to be installed, in unbroken bundles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering asphalt shingles that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Atlas Roofing Corp.
 - 2. Bird, Inc.
 - 3. (The) Celotex Corporation.
 - 4. CertainTeed Corporation.
 - 5. Elk Corporation of America.
 - 6. GAF Building Materials Corporation.
 - 7. Georgia-Pacific Corp.
 - 8. GS Roofing Products Co., Inc.
 - 9. Owens-Corning Fiberglas Corp.
 - 10. Tamko Asphalt Products, Inc.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Ridge Vents:
 - a. Ridge Filter Shinglevent; Air Vent, Inc.
 - b. Ridge Filtervent; Air Vent, Inc. (for Class A).
 - c. Cobra Ridge Vent; GAF Building Materials Corporation.
 - d. Roll Vent; Obdyke: Benjamin Obdyke, Inc.
 - e. Trimline; Trimline Roof Ventilation Systems.

2.2 ASPHALT SHINGLES

- A. Colors, Blends, and Patterns: Where manufacturer's standard products are indicated, provide asphalt shingles with the following requirements:
 - 1. **Laminated Strip Shingles: Three-Dimensional, fiberglass, mineral-faced, self-sealing, multiple overlay construction, fiberglass based asphalt shingle, complying with both ASTM D3018 Type I and ASTM D3462.**
- B. Hip and Ridge Shingles: Job-fabricated units cut from actual asphalt shingles used.

2.3 METAL TRIM AND FLASHING

- A. Sheet Metal Materials: Furnish the following sheet metal materials:
 - 1. Galvanized-Steel Sheets: ASTM A 526, G 90 (ASTM A 526M, Z 275) hot-dip galvanized steel with coating designation according to ASTM A 525 (ASTM A 525M), mill phosphatized where indicated for painting; 0.0217 inch (0.55 mm) thick, unless otherwise indicated.
- B. Metal Drip Edge: Brake-formed sheet metal with at least a 2-inch (50-mm) roof deck flange and a 1-1/2-inch (38-mm) fascia flange with a 3/8-inch (9.6-mm) drip at lower edge. Furnish the following material in lengths of 8 or 10 feet (2.5 to 3 m).
 - 1. Material: Galvanized-steel sheets.
- C. Metal Flashing: Job-cut to sizes and configurations required.
 - 1. Material: Galvanized-steel sheets.
- D. Vent Pipe Flashing: Lead conforming to ASTM B 749, Type L51121, at least 1/16 inch (1.6 mm) thick, unless otherwise indicated. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof extending at least 4 inches (100 mm) from pipe onto roof.

2.4 ACCESSORIES

- A. Felt Underlayment: Type I, 36-inch- (914-mm-) wide, asphalt-saturated organic felt, complying with ASTM D 226 (No. 15) or ASTM D 4869.
- B. Ridge Vent: High-density polypropylene, nonwoven modified polyester, or other UV-stabilized plastic designed to be installed under asphalt shingles at ridge.
- C. Mineral-Surface, Glass-Felt Roll Roofing: Mineral-granular-surfaced, glass-felt-based, asphalt roll roofing, 36 inches (914 mm) wide, complying with ASTM D 3909.
- D. Asphalt Plastic Cement: Nonasbestos fibrated asphalt cement, complying with ASTM D 4586.
- E. Roll-Roofing Lap Cement: Nonasbestos asphalt lap cement, complying with ASTM D 3019, Type III.
- F. Nails: Aluminum or hot-dip galvanized steel, 0.120-inch- (3-mm-) diameter barbed shank, sharp-pointed, conventional roofing nails with a minimum 3/8-inch- (9.5-mm-)

diameter head and of sufficient length to penetrate 3/4 inch (19 mm) into solid decking or at least 1/8 inch (3 mm) through plywood sheathing.

1. Where nails are in contact with flashing, prevent galvanic action by providing nails made from the same metal as that of the flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of asphalt shingles. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with noncorrosive roofing nails.
- B. Coordinate installation with flashings and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and are securely fastened against movement.

3.3 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" or "The NRCA Steep Roofing Manual."
 1. Fasten asphalt shingles to roof sheathing with nails.
- B. Felt Underlayment: Apply 1 layer of felt underlayment horizontally over entire surface to receive asphalt shingles, lapping succeeding courses a minimum of 2 inches (50 mm), end laps a minimum of 4 inches (100 mm), and hips and valleys a minimum of 6 inches (150 mm). Fasten felt with sufficient number of roofing nails or noncorrosive staples to hold underlayment in place until asphalt shingle installation.
 1. Apply an additional layer of felt underlayment on roof decks with a slope of 2 to 4 inches per foot (1:6 to 1:3).
- C. Underlayment at Closed Valleys: Center a 36-inch- (900-mm-) wide felt underlayment in valley and secure with only enough nails to hold in place until asphalt shingles are installed. Lap roof underlayment over valley underlayment at least 6 inches (150 mm).
- D. Woven and Closed-Cut Valleys: Comply with ARMA and NRCA recommendations.
- E. Flashing: Install metal flashing and trim as indicated and according to details and recommendations of the "Asphalt Roofing" section of "The NRCA Steep Roofing Manual" and ARMA's "Residential Asphalt Roofing Manual."

- F. Install asphalt shingles, beginning at roof's lower edge, with a starter strip of roll roofing or inverted asphalt shingles with tabs removed. Fasten asphalt shingles in the desired weather exposure pattern; use number of fasteners per shingle as recommended by manufacturer. Use vertical and horizontal chalk lines to ensure straight coursing.
 - 1. Cut and fit asphalt shingles at valleys, ridges, and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof. Lap asphalt shingles at ridges to shed water away from direction of prevailing wind.
 - 2. Use fasteners at ridges of sufficient length to penetrate sheathing as specified.
 - 3. Pattern: 1/3 shingle spacing offset at succeeding courses.
- G. Ridge Vents: Install ridge vents according to manufacturer's instructions.

3.4 ADJUSTING

- A. Replace any damaged materials installed under this Section with new materials that meet specified requirements.

END OF SECTION 07311

SECTION 07610 SHEET METAL ROOFING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Snap-seam roof panels.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood framing and decking.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for flashing not part of roofing and other sheet metal work.
 - 3. Division 9 Section "Painting" for priming and painting installed metal roofing.

1.3 PERFORMANCE REQUIREMENTS

- A. Install sheet metal roofing capable of withstanding normal thermal movement, wind loading, structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

1.4 SUBMITTALS

- A. Product Data: For each product indicated. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Show details for forming, joining, and securing metal roofing, and for pattern of seams. Show expansion-joint details and waterproof connections to adjoining work and at obstructions and penetrations.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for metal roofing with color-coated finishes.
- D. Samples for Verification: 12-inch- (300-mm-) square specimens of metal roofing material with specified finishes applied. Where finishes involve normal color and texture variations, include Sample sets of 2 or more units showing the full range of variations expected.
- E. Product Certificates: Signed by manufacturers of the following products certifying that the products furnished comply with requirements:
 - 1. Sheet metal roofing.
 - 2. Special finishes.

- F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed sheet metal roofing similar in material, design, forming method, and extent to that indicated for this project and with a record of successful in-service performance.
- B. Industry Standard: Unless otherwise shown or specified, comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "NAFIural Sheet Metal Manual." Conform to dimensions and profiles shown.
- C. Wind-Uplift Resistance: Provide roof assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.
 - 1. Maintain current certification of UL follow-up program for field-rolled panels on field-forming equipment.
- D. Mockups: Before installing sheet metal roofing, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using exposed and concealed materials and forming methods indicated for completed Work.
 - 1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by NAFI.
 - 2. Notify NAFI 7 days in advance of the dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain NAFI's approval of mockups before starting metal roofing work.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
 - a. When directed, remove mockups from project site.
 - b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal coils, panels, and other roofing materials so they will not be damaged or deformed. Package roofing materials for protection against transportation damage.
- B. Handling: Exercise care in unloading, storing, and erecting roofing materials to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store metal roof coils and panels to ensure dryness.

Do not store coils or panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 WARRANTY

- A. **General Warranty:** Special warranties specified in this Article shall not deprive the NAFI of other rights the NAFI may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. **Special Finish Warranty:** Submit a written warranty executed by the manufacturer covering failure of the factory-applied exterior finish on metal roofing within the specified warranty period and agreeing to repair finish or replace sheet metal roofing that evidences finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.
- C. **Warranty Period:** 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
- B. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1. AEP Span.
 - 2. Berridge Manufacturing Co.
 - 3. Or equal.

2.2 ROOFING SHEET METALS

- A. **Metallic-Coated Steel Sheet Prepainted with Coil Coating:** Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755 (ASTM A 755M) and the following requirements:
 - 1. **Galvanized Steel Sheet:** ASTM A 653, G90 (ASTM A 653M, Z275); structural quality.
 - 2. **Thickness:** 24 gauge, unless otherwise indicated.
 - 3. **Finish:** Apply the following organic coating in a thickness of not less than 0.0336 inch (0.85 mm), unless otherwise indicated. Furnish appropriate air-drying spray finish in matching color for touchup.
 - a. **Fluoropolymer 2-Coat Coating System:** Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight with a total minimum dry film thickness of

0.9 mil (0.023 mm) and 30 percent reflective gloss when tested according to ASTM D 523.

- 1) Durability: Provide coating field tested under normal range of weather conditions for minimum of 20 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8 according to ASTM D 4214; and without fading in excess of 5 Hunter units.

B. Panel Characteristics

1. Manufacturer's standard factory-formed, continuous interlocking roof panel assembly designed for concealed mechanical attachment of panels to roof deck.
2. Texture: Smooth
3. Clip: Provide manufacturer's standard clip for roofing application
4. Profile: 1-3/4" Factory roll-formed vertical continuous interlocking seam.
5. Panel Spacing: 16" on center.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, Polymer-Modified, Bituminous Sheet Underlayment: ASTM D 1970, minimum 40 mils (1 mm) thick. Provide primer when recommended by underlayment manufacturer.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. WinterGuard; CertainTeed Corporation.
 - b. Bituthene Ice and Water Shield; Grace: W.R. Grace & Co.
 - c. Nordshield Ice and WaterGuard; Nord Bitumi US, Inc.
 - d. F210; Northern Elastomeric, Inc.
 - e. Polyguard Deck Guard; Polyguard Products, Inc.
 - f. Polyken 640 Underlayment Membrane; Polyken Technologies.
 - g. QSC-707; Quaker Construction Products, Inc.
 - h. Moisture Guard; Tamko Asphalt Products, Inc.
 - i. Jiffy Seal Ice and Water Guard; Protecto Wrap Co.
 - j. Ice Guard Membrane No. 108-AG; Royston Laboratories, Inc.

- B. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felts.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and accessory items as required for a complete roofing system and as recommended by sheet metal manufacturer and fabricator for metal roofing work, unless otherwise indicated.

- B. Expansion-Joint Sealant: For hooked-type expansion joints, which must be free to move, provide nonsetting, nonhardening, nonmigrating, heavy-bodied polyisobutylene sealant.
- C. Primer Paint: Rust-inhibitive primer recommended by sheet metal manufacturer for finish coat.
- D. Metal Accessories: Provide components matching sheet metal roofing in finish and material that are required for a complete roofing system, including the following:
 - 1. Clips, flashings, and ridge closure strips.
 - 2. Trim, copings, fascia, gutters, and louvers.
- E. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- F. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to produce joints in roofing that will remain weathertight and as recommended by the roofing manufacturer for installation indicated.
- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- H. Snow Guards: Prefabricated, noncorrosive units designed to use with sheet metal roofing and complete with predrilled holes or hooks for anchoring.
- I. Battens: Provide battens fabricated from the following materials in the size indicated:
 - 1. Wood Battens: Fabricated to size indicated from lumber complying with requirements of Division 6 Section "Rough Carpentry" and preservative treated by pressure process using a chemical solution that is noncorrosive to type of metal roofing.
 - 2. Aluminum Battens: 0.051 inch (1.3 mm) thick, 6063 alloy aluminum, temper T-5.
 - 3. Copper Battens: 20-oz./sq. ft. (0.7-mm-thick) cold-rolled copper.

2.5 FABRICATION

- A. General: Fabricate sheet metal roofing to comply with details shown, with metal roofing manufacturer's written instructions, and with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of installation indicated.
- B. Fabricate sheet metal to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the work. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks, true to line and levels indicated, and with exposed edges folded back to form hems.

- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the work cannot be used, or would not be sufficiently waterproof and weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant (concealed within joints).
- D. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with bituminous coating or other permanent separation as recommended by manufacturer or fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of sheet metal roofing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate metal roofing with rain drainage work, flashing, trim, and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- B. Promptly remove protective film, if any, from exposed surfaces of metal roofing. Strip with care to avoid damage to finish.

3.3 INSTALLATION, GENERAL

- A. Install roofing to comply with sheet metal roofing manufacturer's written instructions, unless otherwise indicated.
- B. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
- C. Install felt underlayment and building's paper slip sheet on substrate under metal roofing, unless otherwise recommended by sheet metal manufacturer. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under metal roofing. Apply from eave to ridge in shingle fashion and lap joints 2 inches (50 mm) minimum.
- D. Install building paper as only underlayment under terne metal.
- E. Coat back side of metal roofing with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.

- F. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown and as required for leakproof construction. Provide for thermal expansion and contraction of the Work. Seal joints as shown and as required for leakproof construction. Shop fabricate materials to greatest extent possible.
- G. Sealant-Type Joints: Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature is moderate, between 40 and 70 deg F (4 and 21 deg C), at time of installation, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C). Comply with requirements of Division 7 Section "Joint Sealants" for handling and installing sealants.
- H. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges, unless otherwise indicated.
- I. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- J. Rivet joints in uncoated aluminum where necessary for strength. Clean exposed surfaces of every substance that is visible or that might cause corrosion of metal or deterioration of finish.

3.4 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure metal roofing is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 07610

SECTION 07620 SHEET METAL FLASHING AND TRIM**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes sheet metal flashing and trim in the following categories:
 - 1. Roof-drainage systems.
 - 2. Exposed trim and fascia.
 - 3. Metal flashing.
 - 4. Reglets.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.
 - 2. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 - 3. Division 7 Section "Joint Sealants" for elastomeric sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.
- C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.
- D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
 - 1. 8-inch- (200-mm-) square Samples of specified sheet materials to be exposed as finished surfaces.

1.5 PROJECT CONDITIONS

- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

- A. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G 90 (ASTM A 755M, Z 275) coating designation, coil coated with high-performance fluoropolymer coating as specified in "Coil-Coated Galvanized Steel Sheet Finish" Article; not less than 0.0336 inch (0.85 mm) thick, unless otherwise indicated.
- B. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet, with a minimum thickness of 0.0625 inch (1.6 mm) except not less than 0.0937 inch (2.4 mm) thick for applications where burning (welding) is involved.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Burning Rod for Lead: Same composition as lead sheet.
- B. Solder: ASTM B 32, Grade Sn50, used with rosin flux.
- C. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
- D. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.
- E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- F. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."
- G. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
- H. Paper Slip Sheet: 5-lb/square (0.244 kg/sq. m) red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.
- I. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
- J. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.3 FABRICATION, GENERAL

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
- D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- E. Expansion Provisions: Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- F. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.
- G. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
- H. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
 - 1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.4 SHEET METAL FABRICATIONS

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.
- B. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following material:
 - 1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.
- C. Downspouts: Fabricate from the following material:
 - 1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.
- D. Exposed Trim and Fascia: Fabricate from the following material:
 - 1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.
- E. Base Flashing: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.
- F. Counterflashing: Fabricate from the following material:
 1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.
- G. Flashing Receivers: Fabricate from the following material:
 1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.
- H. Drip Edges: Fabricate from the following material:
 1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.
- I. Eave Flashing: Fabricate from the following material:
 1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.
- J. Equipment Support Flashing: Fabricate from the following material:
 1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.
- K. Roof-Penetration Flashing: Fabricate from the following material:
 1. Lead: 4.0 lb/sq. ft. (1.6 mm thick), hard tempered.
- L. Overhead-Piping Safety Pans: Fabricate from the following material:
 1. Galvanized Steel: 0.0396 inch (1.0 mm) thick.

2.5 COIL-COATED GALVANIZED STEEL SHEET FINISH

- A. High-Performance Organic Coating Finish: Apply the following system by coil-coating process on galvanized steel sheet as recommended by coating manufacturers and applicator.
 1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
 - a. Color and Gloss: As selected by NAFI from manufacturer's full range of choices for color and gloss.
 2. Coil-Coated Steel Sheet Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - a. MM Systems Corporation.
 - b. Petersen Aluminum Corporation.
 - c. Vincent Metals.
 - d. Or equal

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.
- D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except where pretinned surface would show in finished Work.
 - 1. Do not solder the following metals:
 - a. Coil-coated galvanized steel sheet.
 - 2. Pretinning is not required for the following metals:
 - a. Lead.
 - 3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- F. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
 - 1. Use joint adhesive for nonmoving joints specified not to be soldered.

- G. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- H. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
 - 1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
 - 2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.
- I. Install reglets to receive counterflashing according to the following requirements:
 - 1. Where reglets are shown in concrete, furnish reglets for installation under Division 3 Section "Cast-in-Place Concrete."
 - 2. Where reglets are shown in masonry, furnish reglets for installation under Division 4 Section "Unit Masonry."
- J. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.
- K. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.
- L. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.
- M. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.
- N. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:
 - 1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
 - 2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.
- O. Splash Pans: Install where downspouts discharge on low-sloped roofs, unless otherwise shown. Set in roof cement or sealant compatible with roofing membrane.

- P. Install continuous gutter screens on gutters with noncorrosive fasteners, arranged as hinged units to swing open for cleaning gutters.

3.3 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07620

SECTION 07920 JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes sealants for the following applications:
 - 1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and frames of doors and windows.
 - e. Other joints as indicated.
 - 2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - g. Joints between all dissimilar materials.
 - h. Other joints as indicated.
 - 3. Interior joints in the following horizontal traffic surfaces:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated.
- B. Related Sections include the following:
 - 1. Division 2 Section "Pavement Joint Sealants" for sealing joints in pavements, walkways, and curbing.
 - 2. Division 8 Section "Glazing" for glazing sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- D. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.
- E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
 - 2. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by NAFI from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
- B. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.
- C. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.4 LATEX JOINT SEALANTS

- A. Latex Sealant Standard: Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.

2.5 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type O: Open-cell material.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
- E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as follows:
 - 1. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
 - 2. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field- adhesion hand-pull test criteria.
 - b. Whether sealants filled joint cavities and are free from voids.
 - c. Whether sealant dimensions and configurations comply with specified requirements.

3. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 4. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- B. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.7 ELASTOMERIC JOINT-SEALANT SCHEDULE

- A. Single-Component Nonsag Urethane Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
1. Products: Available products include the following:
 - a. Chem-Calk 900; Bostik Inc.
 - b. Vulkem 921; Mameco International.
 - c. DyMonic; Tremco.
 - d. Or equal.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Use Related to Exposure: NT (nontraffic).
 5. Applications: All exterior joints.

3.8 LATEX JOINT-SEALANT SCHEDULE

- A. Latex Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:
 - a. Chem-Calk 600; Bostik Inc.
 - b. PSI-701; Polymeric Systems, Inc.
 - c. Sonolac; Sonneborn Building Products Div., ChemRex, Inc.
 - d. Tremflex 834; Tremco.
2. Applications: All interiors joint conditions.

END OF SECTION 07920

DIVISION 8 - DOORS AND WINDOWS

08110 STEEL DOORS AND FRAMES

08211 FLUSH WOOD DOORS

08410 ALUMINUM ENTRANCES AND STOREFRONTS

08712 DOOR HARDWARE (SCHEDULED BY DESCRIBING PRODUCTS)

08801 SECURITY GLAZING

08800 GLAZING

SECTION 08110 STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes steel doors and frames.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 1. Division 4 Section "Unit Masonry" for building anchors into and grouting frames in masonry construction.
 2. Division 8 Section "Flush Wood Doors" for solid-core wood doors installed in steel frames.
 3. Division 8 Section "Door Hardware" for door hardware and weatherstripping.
 4. Division 8 Section "Glazing" for glass in steel doors and sidelights.
 5. Division 9 Section "Gypsum Board Assemblies" for spot grouting frames in gypsum board partitions.
 6. Division 9 Section "Painting" for field painting primed doors and frames.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
- C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.4 QUALITY ASSURANCE

- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to NAFI; otherwise, remove and replace damaged items as directed.
- B. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Steel Doors and Frames:
 - a. Ceco Door Products.
 - b. Curries Co.
 - c. Fenestra Corp.
 - d. Republic Builders Products.
 - e. Steelcraft.

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M).
- B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.
- C. Supports and Anchors: Fabricated from not less than 0.0478-inch- (1.2-mm-) thick steel sheet.
- D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.3 DOORS

- A. Steel Doors: Provide 1-3/4-inch- (44-mm-) thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:
 - 1. Interior Doors: 18 gauge face sheet with vertical 20 gauge reinforcement and fiber insulation fill. 12 gauge hinge rail, 14 gauge lock rail, top rail – 16 gauge with flush cover.

2. Exterior Doors: 16 gauge face sheet with vertical 20 gauge reinforcement and fiber insulation fill. 12 gauge hinge rail, 14 gauge lock rail, top rail – 16 gauge with flush cover.
- B. Door Louvers: Provide louvers according to SDI 111C for interior doors where indicated, with blades or baffles formed of 0.0239-inch- (0.6-mm-) thick cold-rolled steel sheet set into minimum 0.0359-inch- (0.9-mm-) thick steel frame.
1. Sight-Proof Louvers: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2.4 FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 0.0478-inch- (1.2-mm-) thick cold-rolled steel sheet.
1. Fabricate frames with mitered or coped and continuously welded corners.
 2. Fabricate frames with mitered or coped corners knocked down, for field assembly (gypsum board walls only).
 3. Form interior frames from 16 gauge thick steel sheet.
 4. Form exterior frames from 14 gauge thick steel sheet.
- B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.
- C. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- D. Grout: When required in masonry construction, as specified in Division 4 Section "Unit Masonry."

2.5 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
 - a. Rigid polyurethane conforming to ASTM C 591.
 - b. Vertical steel stiffeners.
 - c. Rigid mineral fiber with internal sound deadener on inside of face sheets.
 2. Clearances: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between non-fire-rated pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

- B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel sheet.
- C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.
 - 1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.
- G. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- H. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- I. Glazing Stops: Minimum 0.0359-inch- (0.9-mm-) thick steel or 0.040-inch- (1-mm-) thick aluminum.
 - 1. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers and organic finishes to doors and frames after fabrication.

2.7 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
 - 2. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
 - 3. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
 - 4. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
 - 5. In in-place gypsum board partitions, install knock-down, slip-on, drywall frames.
 - 6. Install fire-rated frames according to NFPA 80.
- C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.

3.2 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

SECTION 08211 FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Sections include the following:
 - 1. Division 6 Section "Interior Architectural Woodwork" for requirements for veneers from the same flitches for both flush wood doors and Architectural woodwork.
 - 2. Division 6 Section "Finish Carpentry" for wood door frames.
 - 3. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, trim for openings, and louvers.
 - 1. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire ratings for fire doors.
- C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 - 1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.
 - 2. Faces of factory-finished doors with opaque finish. Show the full range of colors available.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with the following standard:
 - 1. NWWDA Quality Standard: NWWDA I.S.1-A, "Architectural Wood Flush Doors."
 - 2. AWI Quality Standard: AWI's "Architectural Woodwork Quality Standards" for grade of door, core, construction, finish, and other requirements.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 - 1. Test Pressure: Test at atmospheric pressure.
 - 2. Oversized, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide manufacturer's certificate stating that doors comply with all standard construction requirements of tested and labeled fire-door assemblies except for size.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
 - 1. Individually package doors in plastic bags or cardboard cartons.
- B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with requirements of the referenced quality standard for Project's geographical location.

1.7 WARRANTY

- A. **General Warranty:** Door manufacturer's warranty specified in this Article shall not deprive the NAFI of other rights the NAFI may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. **Door Manufacturer's Warranty:** Submit written agreement on door manufacturer's standard form, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a

3-inch (0.25 mm in a 75-mm) span, or do not comply with tolerances in referenced quality standard.

- 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.**
- 2. Warranty shall be in effect during the following period of time after the date of Substantial Completion:**
 - a. Solid-Core Interior Doors: Life of installation.**

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Flush Wood Doors:
 - a. Ampco Products, Inc.
 - b. Graham Manufacturing Corp.
 - c. IPIK Door Co., Inc.
 - d. Mohawk Flush Doors, Inc.
 - e. Weyerhaeuser Co.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish: Comply with the following requirements:
 1. Grade: Custom (Grade A faces).
 2. Faces: White birch, rotary cut.
 3. Match within Door Faces: Balance match.
 4. Pair and Set Match: Provide for pairs of doors and for doors hung in adjacent sets.
 5. Stiles: Same species as face or a compatible species.

2.3 SOLID-CORE DOORS

- A. Particleboard Cores: Comply with the following requirements:
 1. Particleboard: ANSI A208.1, Grade LD-2.
 2. Blocking: Provide wood blocking at particleboard-core doors as follows:
 - a. 5-inch (125-mm) top-rail blocking, at doors indicated to have closers.
- B. Interior Veneer-Faced Doors: Comply with the following requirements:
 1. Core: Particleboard core.

2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES

- A. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet, factory primed and approved for use in doors indicated.

2.5 FABRICATION

- A. Fabricate flush wood doors in sizes indicated for Project site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-rated doors.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 1. Light Openings: Trim openings with moldings of material and profile indicated.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard's requirements for factory finishing.
- B. Finish wood doors at factory.
- C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
 1. Grade: Premium.
 2. Finish: Manufacturer's standard finish with performance requirements comparable to AWI System TR-6 catalyzed polyurethane.
 3. Staining: None required.
 4. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at Project site.

3.3 ADJUSTING AND PROTECTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08211

SECTION 08410 ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 1. Exterior storefront systems (blast resistant system).
 2. Interior storefront systems.
- B. Related sections include the following:
 1. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
 2. Division 8 Section "Glazing."

1.3 SYSTEM DESCRIPTION

- A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
 1. Air infiltration and water penetration exceeding specified limits.
 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Glazing-to-Glazing Joints: Provide glazing-to-glazing joints that accommodate thermal and mechanical movements of glazing and system, prevent glazing-to-glazing contact, and maintain required edge clearances.
- D. Thermally Broken Construction: Provide systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.
- E. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
 1. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or **3/4 inch (19 mm)**, whichever is smaller, unless otherwise indicated.

2. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
 - a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
 - b. Duration: As required by design wind velocity; fastest **1 mile (1.609 km)** of wind for relevant exposure category.
- F. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
 1. Provide a minimum **1/8-inch (3.18-mm)** clearance between members and top of glazing or other fixed part immediately below.
 2. Provide a minimum **1/16-inch (1.59-mm)** clearance between members and operable windows and doors.
- G. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.
- H. Air Infiltration: Provide entrance and storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than **0.06 cfm/sq. ft. (0.3 L/s/sq. m)** of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of **1.57 lbf/sq. ft. (75.2 Pa)**.
- I. Water Penetration: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than **6.24 lbf/sq. ft. (299 Pa)**. Water leakage is defined as follows:
 1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
- J. Thermal Movements: Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
 1. Temperature Change (Range): **120 deg F (67 deg C)**, ambient; material surfaces.
- K. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.
- L. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.1.

- M. Average Thermal Conductance: Provide storefront systems with average U-values of not more than **0.63 Btu/sq. ft. x h x deg F (3.57 W/sq. m x K)** when tested according to AAMA 1503.1.
- N. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.
- O. Blast test shall be in accordance with ASTM F 2248 and UPC 4-010-01.

1.4 SUBMITTALS

- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. **Shop Drawings: For entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.**
 - 1. **For entrance systems, include hardware schedule and indicate operating hardware types, quantities, and locations.**
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- F. Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturers' written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- G. Field Test Reports: Indicate and interpret test results for compliance with storefront systems' performance requirements.
- H. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of entrance and storefront systems with requirements based on comprehensive testing of current systems.
- I. Submit design analysis with calculations showing that the design of each different size and type of aluminum window unit and its anchorage to the structure meets the minimum antiterrorism standards required by UPC 4-010-01 "DOD Minimum Antiterrorism Standards for Buildings" and paragraph "Minimum Antiterrorism Performance" below. Unless conformance is demonstrated by Standard Airblast Test results. Calculations verifying the structural performance of each window proposed for use, under the given

loads, shall be prepared and signed by a registered Professional Engineer. The window components and anchorage devices to the structure, as determined by the design analysis, shall be reflected in the shop drawings.

- J. For Minimum Antiterrorism windows, in lieu of a Design Analysis, results of airblast testing, whether by arena test or shocktube, shall be included in a test report, providing information in accordance with ASTM F 1642, as prepared by the independent testing agency performing the test. The test results shall demonstrate the ability of each window proposed for use to withstand the airblast loading parameters and achieve the hazard level rating specified in paragraph "Standard Airblast Test Method".

1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
 - 1. **Engineering Responsibility:** Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Submit calculations to substantiate compliance with deflection requirements and Minimum Antiterrorism Performance criteria. A registered Professional Engineer must provide calculations. Submit design analysis with calculations showing that the design of each different size and type of aluminum window unit and its anchorage to the structure meets the requirements of paragraph "Minimum Antiterrorism Performance Criteria". Calculations verifying the structural performance of each window proposed for use, under the given loads, must be prepared and signed by a registered professional engineer. Reflect the window components and anchorage devices to the structure, as determined by the design analysis, in the shop drawings.
- C. **Test Report Requirements:** Submit test reports for each type of window attesting that identical windows have been tested and meet the requirements specified herein for conformance to AAMA/WDMA/CSA 101/I.S.2/A440 including test size, and minimum condensation resistance factor (CRF), and resistance to forced entry, and for Minimum Antiterrorism windows, in lieu of a Design Analysis, results of a Standard Airblast Test.
- D. **Source Limitations:** Obtain each type of entrance and storefront system through one source from a single manufacturer.
- E. **Product Options:** Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
 - 1. Do not modify intended aesthetic effect, as judged solely by NAFI, except with NAFI's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to NAFI for review.

- 1.6 Standard Airblast Test Method: As an alternative to either of the Computational Design Analysis Methods, each Minimum Antiterrorism window type shall be tested for evaluation of hazards generated from airblast loading in accordance with ASTM F 1642 by an independent testing agency regularly engaged in blast testing. For proposed window systems that are of the same type as the tested system, but of different size, the test results may be accepted provided the proposed window size is within the range from 25 percent smaller to 10 percent larger in area, than the tested window. Proposed windows of a size outside this range shall require testing to evaluate their hazard rating. Testing may be by shocktube or arena test. The test shall be performed on the entire proposed window system, which shall include, but not limited to the glazing, its framing system, operating devices, and all anchorage devices. Anchorage of the window frame or subframe shall replicate the method of installation to be used for the project. The minimum airblast loading parameters for the test shall be as follows: Peak positive pressure of 5.8 psi 50 kPa and positive phase impulse of 41.1 psi-msec 285 kPa-msec. The hazard rating for the proposed window systems, as determined by the rating criteria of ASTM F 1642, shall not exceed the "Very Low Hazard" ratings (i.e. the "No Break", "No Hazard", "Minimal Hazard" and "Very Low Hazard" rating are acceptable. "Low Hazard" and High Hazard" ratings are unacceptable)> Results of window systems previously tested by testing protocols other than ASTM F 1642 may be accepted provided the required loading, hazard level rating, and size limitations stated herein are met.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating systems without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.8 WARRANTY

- A. **General Warranty:** The special warranty specified in this Article shall not deprive the NAFI of other rights the NAFI may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. **Special Warranty:** Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
1. Structural failures including, but not limited to, excessive deflection.
 2. Adhesive sealant failures.
 3. Cohesive sealant failures.
 4. Failure of system to meet performance requirements.
 5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

- 6. **Failure of operating components to function normally.**
- 7. **Water leakage through fixed glazing and frame areas.**

C. **Warranty Period: Two (2) years from date of Substantial Completion.**

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Arch Amarlite.
 - 2. Vistawall Architectural Products.
 - 3. EFCO Corporation.
 - 4. International Aluminum Corporation; U.S. Aluminum.
 - 5. Kawneer Company, Inc.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
 - 1. Sheet and Plate: **ASTM B 209 (ASTM B 209M).**
 - 2. Extruded Bars, Rods, Shapes, and Tubes: **ASTM B 221 (ASTM B 221M).**
 - 3. Extruded Structural Pipe and Tubes: **ASTM B 429.**
 - 4. Bars, Rods, and Wire: **ASTM B 211 (ASTM B 211M).**
- B. Steel Reinforcement: Complying with **ASTM A 36 (ASTM A 36M)** for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or **ASTM A 570 (ASTM A 570M)** for hot-rolled sheet and strip.
- C. Glazing as specified in Division 8 Section "Glazing."
- D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
- E. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
- F. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."

- G. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for **30-mil (0.762-mm)** thickness per coat.

2.3 COMPONENTS

- A. Doors: Provide manufacturer's standard **1-3/4-inch- (44.5-mm-)** thick glazed doors with minimum **0.125-inch- (3.2-mm-)** thick, extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.
 - 1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets. Provide for 1/4" glazing.
 - 2. Stile Design: Medium stile; **3-1/2-inch (88.9-mm)** nominal width.
 - 3. Bottom rail: 6-1/2" width.
- B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Reinforce members as required to retain fastener threads.
 - 2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.
- F. Concealed Flashing: Dead-soft, **0.018-inch- (0.457-mm-)** thick stainless steel, complying with ASTM A 666, of type selected by manufacturer for compatibility with system.
- G. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
 - 1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
 - 2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

2.4 HARDWARE

- A. General: Provide heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for entrances indicated. Finish exposed parts to match door finish, unless otherwise indicated.

- B. Continuous Gear Hinges: Manufacturer's standard, continuous, aluminum gear hinges.
- C. Closers, General: Comply with manufacturer's recommendations for closer size, depending on door size, exposure to weather, and anticipated frequency of use.
 - 1. Closing Cycle: Comply with requirements of authorities having jurisdiction or the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," whichever are more stringent.
 - 2. Closers shall be equal to LCN 4040.
- D. Door Stops: ANSI/BHMA A156.16, Grade 1, floor- or wall-mounted door stop, as appropriate for door location indicated, with integral rubber bumper.
- E. Cylinders: As specified in Division 8 Section "Door Hardware."
- F. Cylinder Guard: Manufacturer's standard hardened-steel security ring with retainer plate for inside stile wall that protects lock cylinder from removal by wrenches, prying, or sawing.
- G. Vertical-Rod Exit Devices: Concealed, vertical-rod exit device complying with UL 305 requirements, with 2-point top and bottom latching that is released by a full-width crash bar or when locked down (dogged) by lock cylinder or retracting screws beneath housing. Equal to Kawneer Paneline with standard opposing pull.
- H. Removable Mullions: Manufacturer's standard aluminum or aluminum-clad-steel removable mullion with mullion stabilizers located below latch strikes.
- I. Pull Handles: As selected by NAFI from manufacturer's full range of pull handles and plates.
- J. Push Bars: As selected by NAFI from manufacturer's full range of full-door-width, single-bar push bars.
- K. Thresholds: At exterior doors, provide manufacturer's standard threshold with cutouts coordinated for operating hardware, with anchors and jamb clips, and not more than **1/2-inch- (12.7-mm-)** high, with beveled edges providing a floor level change with a slope of not more than 1:2, and in the following material:
 - 1. Material: Aluminum, mill finish.
- L. Weather Sweeps: Manufacturer's standard weather sweep for application to exterior door bottoms and with concealed fasteners on mounting strips.

2.5 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - 1. Fabricate components for screw-spline frame construction.

- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- I. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
 - 1. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames.
- J. Framing Systems (Interior):
 - 1. System: Kawneer or equal, Trifab #451, screw spline or equal, with 1" glazing.
- K. Framing Systems (Exterior):
 - 1. System: Kawneer or equal, IR 501, screw spline or equal, with 1-5/16" insulated.

2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - 1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluorocarbon topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
 - a. Color and Gloss: As selected by NAFI from manufacturer's full range of choices for color and gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.
 - 1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - 2. Install structural silicone sealant according to sealant manufacturer's written instructions.
 - 3. Mechanically fasten glazing in place until structural sealant is cured.
 - 4. Remove excess sealant from component surfaces before sealant has cured.
- H. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.
- I. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.
- J. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
 - 1. Variation from Plane: Limit variation from plane or location shown to **1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm)** over total length.
 - 2. Alignment: Where surfaces abut in line, limit offset from true alignment to **1/16 inch (1.5 mm)**. Where surfaces meet at corners, limit offset from true alignment to **1/32 inch (0.8 mm)**.
 - 3. Diagonal Measurements: Limit difference between diagonal measurements to **1/8 inch (3 mm)**.

3.3 FIELD QUALITY CONTROL

- A. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08410

SECTION 08712 DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
 - 2. Cylinders for doors specified in other Sections.
- B. Related Sections include the following:
 - 1. Division 8 Section "Steel Doors and Frames" for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.
 - 2. Division 8 Section "Flush Wood Doors" for astragals provided as part of a fire-rated labeled assembly.
 - 3. Division 8 Section "Aluminum Entrances and Storefronts" for entrance door hardware, except cylinders.
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - 1. Cylinders for locks on aluminum and glass entrance doors.

1.3 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of door hardware indicated.
- C. Samples: For exposed door hardware of each type indicated below, in specified finish, full size. Tag with full description for coordination with the Door Hardware Schedule. Submit samples before, or concurrent with, submission of the final Door Hardware Schedule if requested by NAFI.
 - 1. Door Hardware: As follows:
 - a. Hinges.
 - b. Locks and latches.

- c. Exit devices.
 - d. Cylinders and keys.
 - e. Closers.
 - f. Door gasketing.
 - g. As requested by NAFI.
- 2. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- D. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
 - 5. Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in the Project construction schedule. Submit the final Door Hardware Schedule after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.

- E. Keying Schedule: Prepared by or under the supervision of supplier, detailing NAFI's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
 - 1. Include lists of completed projects with project names and addresses of NAFIs, and other information specified.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current products comply with requirements.
- H. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
- I. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, and NAFI about door hardware and keying. Supplier must be approved by NAFI.
 - 1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- E. Regulatory Requirements: Comply with provisions of the following:
 - 1. Comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, FED-STD-795, "Uniform Federal Accessibility Standards," as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:

- 1) Interior Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
- c. Thresholds: Not more than **1/2 inch (13 mm)** high. Bevel raised thresholds with a slope of not more than 1:2.
2. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 15 lbf (67 N) for not more than 3 seconds.
 - c. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
 - d. Thresholds: Not more than 1/2 inch (13 mm) high.
- F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Address for delivery of keys.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to door hardware including, but not limited to, the following:
 1. Inspect and discuss roughing-in and other preparatory work performed by other trades.
 2. Review sequence of operation for each type of door hardware.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review required testing, inspecting, and certifying procedures.
- 1.5 DELIVERY, STORAGE, AND HANDLING
 - A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
 - B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
 - C. Deliver keys to manufacturer of key control system.

1.6 COORDINATION

- A. **Templates:** Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 WARRANTY

- A. **General Warranty:** Special warranties specified in this Article shall not deprive NAFI of other rights NAFI may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. **Special Warranty:** Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. **Structural failures including excessive deflection, cracking, or breakage.**
 - 2. **Faulty operation of operators and door hardware.**
 - 3. **Deterioration of metals, metal finishes, and other materials beyond normal weathering.**
- C. **Warranty Period:** Five (5) years from date of Substantial Completion, unless otherwise indicated.

1.8 MAINTENANCE SERVICE

- A. **Maintenance Tools and Instructions:** Furnish a complete set of specialized tools and maintenance instructions as needed for NAFI's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. **Maintenance Service:** Beginning at Final Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. **General:** Provide door hardware for each door to comply with requirements in this Section and as provided via allowance.
 - 1. **Door Hardware Sets:** Requirements for quantity, item, design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by descriptive titles corresponding to requirements specified in Part 2.

2.2 HINGES, GENERAL

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hinges:

- a. Hager Companies.
- b. McKinney Products Company; Div. of ESSEX Industries, Inc.
- c. Stanley Commercial Hardware; Div. of The Stanley Works.

2. Continuous Geared Hinges:

- a. Hager Companies.
- b. McKinney Products Company; Div. of ESSEX Industries, Inc.
- c. Pemko Manufacturing Co., Inc.

- B. Standards: Comply with the following:

- 1. Butts and Hinges: BHMA A156.1.
- 2. Template Hinge Dimensions: BHMA A156.7.
- 3. Self-Closing Hinges and Pivots: BHMA A156.17.

- C. Quantity: Provide the following, unless otherwise indicated:

- 1. Three Hinges: For doors with heights 90 inches (1549 to 2286 mm).
- 2. Four Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).
- 3. For doors with heights more than 120 inches (3048 mm), provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).

- D. Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches)	
		Standard Weight	Heavy Weight
32 by 84 by 1-3/8	3-1/2	0.123	-
36 by 84 by 1-3/8	4	0.130	-
36 by 84 by 1-3/4	4-1/2	0.134	0.180
42 by 90 by 1-3/4	4-1/2	0.134	0.180
48 by 120 by 1-3/4	5	0.146	0.190

- E. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

- F. Hinge Applications: Unless otherwise indicated, provide the following:

1. Entrance Doors: Heavy-weight hinges.
2. Doors with Closers: Antifriction-bearing hinges.
3. Interior Doors: Standard-weight hinges.

G. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Brass, with stainless-steel pin body and brass protruding heads.
2. Interior Hinges: Brass, with stainless-steel pin body and brass protruding heads.
3. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin.

H. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors] [wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 LOCKS AND LATCHES, GENERAL

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Mechanical Locks and Latches:
 - a. Best Lock Corporation.
 - b. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc.
 - c. Yale Security Inc.; Div. of Williams Holdings.

B. Standards: Comply with the following:

1. Bored Locks and Latches: BHMA A156.2.
2. Mortise Locks and Latches: BHMA A156.13.
3. Interconnected Locks and Latches: BHMA A156.12.
4. Auxiliary Locks: BHMA A156.5.
5. Push-Button Combination Locks: BHMA A156.2.
6. Exit Locks: BHMA A156.5.

2.4 EXIT DEVICES, GENERAL

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Precision Hardware, Inc.
2. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc.
3. Von Duprin; an Ingersoll-Rand Company.

- B. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."
- C. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- D. Through Bolts: For exit devices and trim on metal doors, non-fire-rated wood doors, fire-rated wood doors.

2.5 CYLINDERS AND KEYING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cylinders: Same manufacturer as for locks and latches.
 - 2. Cylinders:
 - a. Best Lock Corporation.
- B. Standards: Comply with the following:
 - 1. Cylinders: BHMA A156.5.
- C. Furnish keys in the following quantities:
 - 1. Two (2) each – Grand Masterkeys.
 - 2. Two (2) each – Control Keys.
 - 3. Four (4) each – Masterkeys.
 - 4. Three (3) each – Change Keys each keyed core.
 - 5. 12 each – Construction Masterkeys.
 - 6. Two (2) each – Construction Control Keys.

2.6 CLOSERS, GENERAL

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Surface-Mounted Closers:
 - a. LCN Closers; an Ingersoll-Rand Company.
 - b. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc.
 - c. Yale Security Inc.; Div. of Williams Holdings.
- B. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."
- C. Hold-Open Closers/Detectors: Coordinate and interface integral smoke detector and closer device with fire alarm system.

2.7 THRESHOLDS, GENERAL

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hager Companies.
 - 2. National Guard Products, Inc.
 - 3. Pemko Manufacturing Co., Inc.
- B. Standard: Comply with BHMA A156.21.

2.8 FABRICATION

- A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by NAFI.
 - 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Steel Machine or Wood Screws: For the following fire-rated applications:
 - a. Mortise hinges to doors.
 - b. Strike plates to frames.
 - c. Closers to doors and frames.
 - 3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:
 - a. Surface hinges to doors.
 - b. Closers to doors and frames.
 - c. Surface-mounted exit devices.
 - 4. Spacers or Sex Bolts: For through bolting of hollow metal doors.

5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.9 FINISHES

- A. Standard: Comply with BHMA A156.18.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. BHMA Designations: Comply with base material and finish requirements indicated by the following:
 1. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of door hardware.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 series.
 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.
- B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that

are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Supplier will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 3. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
 2. Consult with and instruct NAFI's personnel on recommended maintenance procedures.
 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train NAFI's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 SCHEDULE OF FINISH HARDWARE

Manufacturer List

<u>Code</u>	<u>Name</u>
AB	ABH Manufacturing Inc.
BE	Best Access Systems
NA	National Guard
PE	Pemko
ST	Stanley
TR	Trimco

Option List

<u>Code</u>	<u>Description</u>
B4E	BEVELED 4 EDGES
CSK	COUNTER SINKING OF PLATES

Finish List

<u>Code</u>	<u>Description</u>
626	Satin Chromium Plated
630	Satin Stainless Steel
652	Chromium Plated, Dull
689	Aluminum Painted
GRE	Grey

Hardware Sets**SET #1 - Entrance**

2 Mortise Cylinder	1E-74 PATD	626	BE
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NOTE: Verify mortise cylinder is type required. All remaining hardware by door manufacturer.

SET #2 - Vestibule

NOTE: Hardware complete by door manufacture.

SET #3 - Kitchen

3 Hinges	FBF199 5 X 4 1/2 NRP	630	ST
1 Lockset	45H-7AB14H PATD	626	BE
1 Door Closer	D-4550 HCS	689	ST
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Saddle Threshold	425		NA
1 Gasketing	161 SA x Head & Jambs		NA
1 Door Sweep	200 NA		NA

SET #4 - Mech.

3 Hinges	FBF191 5 X 4 1/2 NRP	626	ST
1 Lockset	45H-7D14H PATD	626	BE
1 Overhead Stop	9023	630	AB
1 Saddle Threshold	425		NA
1 Door Sweep	200 NA		NA
1 Drip Cap	16A x 4" ODW		NA

SET #100 - Pro/Dining

2 Mortise Cylinder	1E-74 PATD	630	BE
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NOTE: Verify mortise cylinder is type required. All remaining hardware by door manufacturer

SET #101 - Office

3 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Lockset	45H-7A14H PATD	626	BE
1 Wall Bumper	1270CV	626	TR
3 Door Silencers	1229A	GRE	TR

SET #102 - Restrooms

3 Hinges	FBF168 4 1/2 X 4 1/2	630	ST
1 Push Plate	1001-3	630	TR
1 Pull Plate	1013-3B	630	TR
1 Door Closer	D-4551 REG	689	ST
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Mop Plate	KM050 6" x 1" LDW B4E SCK	630	TR
1 Wall Bumper	1270CV	626	TR
1 Smoke Seal	S88 D x Head & Jambs		PE

SET #103 - Storage

3 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Lockset	45H-7R14H PATD	626	BE
1 Wall Bumper	1270CV	626	TR
3 Door Silencers	1229A	GRE	TR

SET #104 - Janitor

3 Hinges	FBF179 4 1/2 X 4 1/2	630	ST
1 Lockset	45H-7D14H PATD	626	BE
1 Door Closer	D-4551 REG or EDA	689	ST
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Mop Plate	KM050 6" x 1" LDW B4E SCK	630	TR
1 Wall Bumper	1270CV	626	TR
1 Smoke Seal	S88 D x Head & Jambs		PE

SET #105 - Elect

3 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Lockset	45H-7D14H PATD	626	BE
1 Door Closer	D-4551 REG	689	ST
1 Wall Bumper	1270CV	626	TR
1 Smoke Seal	S88 D x Head & Jambs		PE

SET #106 - Misc.

1 Padlock	41B-722L M1	626	BE
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Opening List

<u>Opening</u>	<u>Hdw Set</u>
100	1
102	3
103	101
104	103
105	104
107	102
108	102
109	103
110	102
111	102
112	104
113	105
114	103
115	1
117	101
118	4
101A	2
101B	1
116A	2
116B	100
116C	1

END OF SECTION 08712

SECTION 08800 GLAZING (NON-SECURITY)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Doors.
 - 2. Glazed entrances.
 - 3. Interior borrowed lites.
 - 4. Storefront framing.

1.3 DEFINITIONS

- A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
 - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.

- c. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - 1) For monolithic-glass lites heat treated to resist wind loads.
 - d. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
 - e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
 - C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient.
 - D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
- 1.5 SUBMITTALS
- A. Product Data: For each glass product and glazing material indicated.
 - B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass.
 - C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 - D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Owners, and other information specified.
 - E. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
 - F. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:
 - 1. Glazing sealants.
 - 2. Glazing gaskets.
 - G. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- D. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
 - 2. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in schedules at the end of Part 3.

2.2 PRIMARY FLOAT GLASS

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 HEAT-TREATED FLOAT GLASS

- A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.

2.4 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by NAFI from manufacturer's full range for this characteristic.
- B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
 1. Additional Movement Capability: Where additional movement capability is specified in the Glazing Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 GLAZING GASKETS

- A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.
- B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene, ASTM C 864.
 - 2. EPDM, ASTM C 864.
 - 3. Silicone, ASTM C 1115.
 - 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 - 5. Any material indicated above.
- C. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene.
 - 2. EPDM.
 - 3. Silicone.
 - 4. Thermoplastic polyolefin rubber.
 - 5. Any material indicated above.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.8 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.
- C. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where the length plus width is larger than 50 inches (1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants

cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.9 GLAZING SEALANT SCHEDULE

- A. Low-Modulus Nonacid-Curing Silicone Glazing Sealant GS: Where glazing sealants of this designation are indicated, provide products complying with the following:

1. Products: **Available products include the following:**

- a. 790; Dow Corning.
- b. Silpruf; GE Silicones.
- c. PSI-641; Polymeric Systems, Inc.
- d. Omniseal; Sonneborn, Div of ChemRex, Inc.
- e. Spectrem 1; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Additional Movement Capability: 100 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
5. Use Related to Exposure: NT (non-traffic).

END OF SECTION 08800

SECTION 08801 - SECURITY GLAZING (ATFP)**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes ATFP compliant glazing for the following products and applications and of the following types:
 - 1. Products and applications specified in other Sections where glazing requirements are specified by reference to this Section:
 - a. Steel doors and frames.
 - b. Storefront framing.
 - 2. Security Glazing Types:
 - a. Laminated glass.
 - b. Insulating security glazing.
- B. Related Sections:
 - 1. Section 08800 "Glazing" for nonsecurity glazing in the form of monolithic glass and insulating glass.

1.3 DEFINITIONS

- A. Glazing Manufacturers: Firms that produce primary glass, monolithic plastic glazing, or fabricated security glazing, as defined in referenced glazing publications.
- B. Interspace: Space between lites of insulating security glazing.

1.4 PERFORMANCE REQUIREMENTS

- A. General:
 - 1. Installed security glazing shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing; or other defects in construction.

2. Installed security glazing shall withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.
- B. Delegated Design: Design security glazing, including comprehensive engineering analysis by a qualified professional engineer.
1. Design Procedure for Glass: Design according to ASTM E 1300 and ASTM F 2248.
 2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Basic Wind Speed: 100 mph (44 m/s).
 - b. Importance Factor: 1.0.
 - c. Exposure Category: C.
 3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glazing framing members and glazing components.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each security glazing type, tape sealant, gasket, glazing accessory, and glazing-framing member for adhesion to and compatibility with elastomeric glazing sealants.
1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to security glazing, tape sealants, gaskets, and glazing channel substrates.
 3. Test no fewer than eight. Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Security Glazing Samples: For each type of security glazing; 12 inches (300 mm) square.
- C. Glazing Accessory Samples: For gaskets, sealants, and spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Security Glazing Schedule: List security glazing types and thicknesses for each size opening and location. Use same designations indicated on Drawings. Indicate coordinated dimensions of security glazing and construction that receives security glazing, including clearances and glazing channel dimensions.
- E. Delegated-Design Submittal: For security glazing indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers, manufacturers of insulating security glazing with sputter-coated, low-e coatings, glazing testing agency, and sealant testing agency.
- B. Product Certificates: For each type of product indicated, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of security glazing, glazing sealant, and glazing gasket.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test reports.
- E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating Security Glazing Units with Sputter-Coated, Low-E Coatings: A qualified insulating glazing manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glazing installers for this Project who are certified under the National Glass Association Glazier Certification Program.
- C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Source Limitations for Security Glazing: Obtain security glazing from single source from single manufacturer using the same type of lites, plies, interlayers, and spacers for each security glazing type indicated.

1. Source Limitations for Tinted Glass: Obtain tinted glass from single source from single primary glass manufacturer for each tint color indicated.
 - E. Source Limitations for Glazing **[Sealants] [and] [Gaskets]**: Obtain from single source from single manufacturer for each product and installation method.
 - F. Publications: Comply with published recommendations of security glazing and glazing material manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
 2. "DoD Security Engineering Facilities Design Manual.
 3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
 - G. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or manufacturer. Label shall indicate manufacturer's name, type of glazing, thickness, and safety glazing standard with which glazing complies.
 - H. Insulating Glazing Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
 - I. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Install security glazing in mockups specified in Section 08410 "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - J. Preinstallation Conference: Conduct conference at Project site.
 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Review temporary protection requirements for security glazing during and after installation.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Protect security glazing and glazing materials according to manufacturer's written instructions. Prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

- B. Comply with insulating security glazing and with air-gap security glazing manufacturers' written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.11 COORDINATION

- A. Coordinate dimensions, including thickness, of security glazing with dimensions of construction that receives security glazing.

1.12 WARRANTY

- A. **Manufacturer's Special Warranty for Coated Glass:** Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated glass that deteriorates within specified warranty period. Deterioration is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. **Warranty Period: 10 years from date of Substantial Completion.**
- B. **Manufacturer's Special Warranty on Laminated Glass:** Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated glass that deteriorates within specified warranty period. Deterioration is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. **Warranty Period: 10 years from date of Substantial Completion.**
- C. **Manufacturer's Special Warranty on Insulating Security Glazing:** Manufacturer's standard form in which insulating security glazing manufacturer agrees to replace insulating security glazing that deteriorates within specified warranty period. Deterioration is defined as defects in individual lites developed from normal use or failure of hermetic seal under normal use. Deterioration does not

include defects in individual lites or failure of hermetic seal that is attributed to glass breakage or to maintaining and cleaning insulating security glazing contrary to manufacturer's written instructions.

- 1. Defects in coated glass lites include peeling, cracking, and other indications of deterioration in coating.**
- 2. Defects in laminated-glass lites include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.**
- 3. Defects in glass-clad polycarbonate lites include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.**
- 4. Evidence of hermetic seal failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glazing.**
- 5. Warranty Period: 10 years from date of Substantial Completion.**

PART 2 - PRODUCTS

2.1 SECURITY GLAZING, GENERAL

- A. Thickness:** Where thickness is indicated, it is a minimum. Provide security glazing in thicknesses as needed to comply with requirements indicated.
- B. Thickness of Tinted Glass:** Provide same thickness for each tint color indicated throughout Project.
- C. Fire-Test-Response Characteristics of Plastic Sheets:** As determined by testing plastic sheets identical to those used in security glazing products by a qualified testing agency acceptable to authorities having jurisdiction.
 1. Self-ignition temperature of 650 deg F (343 deg C) or more when tested per ASTM D 1929 on plastic sheets in thicknesses indicated for the Work.
 2. Smoke-developed index of 450 or less when tested according to ASTM E 84, or smoke density of 75 or less when tested per ASTM D 2843 on plastic sheets in thicknesses indicated for the Work.
 3. Burning extent of 1 inch (25 mm) or less when tested per ASTM D 635 at a nominal thickness of 0.060 inch (1.52 mm) or thickness indicated for the Work.
- D. Thermal and Optical Performance Properties:** Provide security glazing with performance properties specified, as indicated in manufacturer's published test data, based on products of construction indicated and on procedures indicated below:
 1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 2. Solar-Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 2. For fully tempered float glass, comply with requirements for Kind FT.
 - 3. For uncoated glass, comply with requirements for Condition A.
 - 4. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.3 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
 - 2. Flat glass shall be laminated together with a minimum 0.030 inch thick, clear polyvinyl butyral interlayer. The total thickness shall be nominal $\frac{1}{4}$ ".
- B. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, with "Windborne-Debris-Impact Resistance" Paragraph, and with other requirements specified.
 - 1. Construction: Laminate glass with the following to comply with interlayer manufacturer's written recommendations:
 - a. Polyvinyl butyral interlayer.
 - 2. Interlayer Color: Clear unless otherwise indicated.

2.4 INSULATING SECURITY GLAZING

- A. Insulating Security Glazing: Factory-assembled units consisting of sealed lites separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
 - 1. Sealing System: Dual seal, with polyisobutylene and polyurethane primary and secondary.
 - 2. Spacer: Thermally broken aluminum.
 - 3. Desiccant: Molecular sieve or silica gel, or blend of both.

2.5 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 - 1. Neoprene complying with ASTM C 864.
 - 2. EPDM complying with ASTM C 864.
 - 3. Silicone complying with ASTM C 1115.
 - 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
 - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.6 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including security glazing, seals of insulating security glazing and air-gap security glazing, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and security glazing manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Sealants used inside the weatherproofing system shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
 - 4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 5. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. May National Associates, Inc.; Bondaflex Sil 290.
 - d. Pecora Corporation; 890.

- e. Sika Corporation, Construction Products Division; SikaSil-C990.
- f. Tremco Incorporated; Spectrem 1.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and security glazing manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of security glazing and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by security glazing manufacturer to maintain security glazing lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit security glazing lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF SECURITY GLAZING

- A. Fabricate security glazing in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.10 LAMINATED-GLASS SECURITY GLAZING TYPES

A. Security Glazing Type SG-1 Tinted reflective-coated laminated glass.

1. Blast Resistance:
 - a. Hazard Rating: Low Hazard Per UFC 4-010-01.
2. Number of Plies: Two.
3. Overall Unit Thickness: ¼ inch.
4. Outer Ply: 6-mm fully tempered float glass.
5. Inner Ply: 6-mm fully tempered float glass.
6. Interlayer Thickness: 0.030 inch.
7. Glass Tint Color: Bronze.
8. Tinted Glass Location: Outer ply.
9. Overall Visible Light Transmittance: 42%.
10. Winter Nighttime U-Factor: 0.29 maximum.
11. Summer Daytime U-Factor: 0.27 maximum.
12. Solar Heat-Gain Coefficient: 0.27 maximum.
13. Provide safety glazing labeling.

2.11 INSULATING SECURITY GLAZING TYPES

A. Security Glazing Type SG 1: Low-e-coated, tinted insulating security glazing. Outdoor lite is laminated glass and indoor lite is laminated glass.

1. Blast Resistance:
 - a. Hazard Rating: Low Hazard per UFC 4-010-01.
2. Overall Unit Thickness: 1 inch.
3. Outdoor Lite: Laminated glass with two outer plies of heat-strengthened float glass and two inner plies of annealed float glass.
 - a. Outer Ply Thickness: 6 mm.
 - b. Inner Ply Thickness: 6 mm.
 - c. Interlayer Thickness: 0.030 inch.
4. Interspace Content: Air.
5. Interspace Dimension: ½ inch.
6. Glass Tint Color: Bronze.
7. Tinted Glass Location: Outer lite.
8. Low-E Coating: Pyrolytic.
9. Overall Visible Light Transmittance: 42 percent minimum.
10. Winter Nighttime U-Factor: 0.29 maximum.
11. Summer Daytime U-Factor: 0.27 maximum.
12. Solar Heat-Gain Coefficient: 0.27 maximum.
13. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing for security glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving security glazing immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of security glazing, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect edges of security glazing from damage during handling and installation. Remove damaged security glazing from Project site and legally dispose of off Project site. Damaged security glazing includes units with edge or face damage or other imperfections that, when installed, could weaken security glazing, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by security glazing manufacturers for installing lites.
- F. Provide spacers for security glazing lites where the length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of security glazing. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated

- ability to maintain required face clearances and to comply with performance requirements.
- 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glazing lites and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- 3. Reference UFC 4-010-01 ATFP Section B-3.1.2.
- G. Provide edge blocking where indicated or needed to prevent security glazing from moving sideways in glazing channel, as recommended in writing by security glazing manufacturer and according to requirements in referenced glazing publications.
- H. Set security glazing in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set coated security glazing with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by security glazing, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center security glazing in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket securely in place between glazing unit and frame or fixed stop, with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center security glazing in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center security glazing in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between security glazing and glazing stops to maintain face clearances and to prevent sealant from extruding into glazing channel and blocking weep systems. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to security glazing and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from security glazing.

3.7 PROTECTION AND CLEANING

- A. Protect exterior security glazing from damage immediately after installation by attaching crossed streamers to framing held away from glazing unit. Do not apply markers to security glazing surfaces. Remove nonpermanent labels, and clean surfaces.
- B. Protect security glazing from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection,

contaminating substances do come into contact with security glazing, remove substances immediately as recommended in writing by security glazing manufacturer.

- C. Examine security glazing surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by security glazing manufacturer.
- D. Remove and replace security glazing that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, or vandalism during construction period.
- E. Wash security glazing on exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash security glazing as recommended in writing by security glazing manufacturer.

END OF SECTION 08801

DIVISION 9 - FINISHES

09255	GYPSUM BOARD ASSEMBLIES
09310	CERAMIC TILE
09511	ACOUSTICAL PANEL CEILINGS
09681	CARPET (TILE)
09900	PAINTING

SECTION 09255 GYPSUM BOARD ASSEMBLIES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Nonload-bearing steel framing members for gypsum board assemblies.
 - 2. Gypsum board assemblies attached to steel framing.
 - 3. Gypsum board assemblies attached to wood framing.
 - 4. Glass-mat, water-resistant gypsum backing board installed with gypsum board assemblies.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 5 Section "Cold-Formed Metal Framing" for load-bearing steel framing.
 - 2. Division 6 Section "Rough Carpentry" for wood framing and furring, and gypsum sheathing applied over wood framing.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

- C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours before application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Steel Framing and Furring:
 - a. Consolidated Systems, Inc.
 - b. Dale Industries, Inc.
 - c. Marino/Ware (formerly Marino Industries Corp.).
 - d. National Gypsum Co.; Gold Bond Building Products Division.
 - 2. Grid Suspension Assemblies:
 - a. Armstrong World Industries, Inc.
 - b. Chicago Metallic Corp.
 - c. USG Interiors, Inc.
 - d. Worthington Steel Company (formerly National Rolling Mills).

3. Gypsum Board and Related Products:

- a. Georgia-Pacific Corp.
- b. National Gypsum Co.; Gold Bond Building Products Division.
- c. United States Gypsum Co.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. General: Provide components complying with ASTM C 754 for conditions indicated.
- B. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190 conducted by a qualified independent testing agency.
- C. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.062 inch (1.6 mm) thick.
- D. Wire Hangers: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch (4.1-mm) diameter.
- E. Hanger Rods: Mild steel and zinc coated or protected with rust-inhibitive paint.
- F. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive paint.
- G. Angle-Type Hangers: Angles with legs not less than 7/8 inch (22.2 mm) wide, formed from 0.0635-inch- (1.6-mm-) thick galvanized steel sheet complying with ASTM A 653, G 90 (ASTM A 653M, Z 180) coating designation, with bolted connections and 5/16-inch (8-mm) diameter bolts.
- H. Channels: Cold-rolled steel, 0.0598-inch (1.5-mm) minimum thickness of base (uncoated) metal and 7/16-inch- (11.1-mm-) wide flanges, and as follows:
 - 1. Carrying Channels: 1-1/2 inches (38.1 mm) deep, 475 lb/1000 feet (70 kg/100 m), unless otherwise indicated.
 - 2. Furring Channels: 3/4 inch (19.1 mm) deep, 300 lb/1000 feet (45 kg/100 m), unless otherwise indicated.
 - 3. Finish: Rust-inhibitive paint, unless otherwise indicated.
 - 4. Finish: ASTM A 653, G 60 (ASTM A 653M, Z 180) hot-dip galvanized coating for framing for exterior soffits and where indicated.
- I. Steel Studs for Furring Channels: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 - 1. Depth: 2-1/2 inches (63.5 mm), unless otherwise indicated.
 - 2. Protective Coating: Manufacturer's standard corrosion-resistant coating.

- J. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth of 7/8 inch (22.2 mm), and minimum thickness of base (uncoated) metal as follows:
 - 1. Protective Coating: Manufacturer's standard corrosion-resistant coating.
- K. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross-furring members that interlock to form a modular supporting network.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

- A. General: Provide steel framing members complying with the following requirements:
 - 1. Protective Coating: Manufacturer's standard corrosion-resistant coating.
- B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 - 1. Thickness: 20 gauge unless otherwise indicated.
 - 2. Depth: 3-5/8 inches (92.1 mm), unless otherwise indicated.
 - 3. Depth: 6 inches (152.4 mm) where indicated.
 - 4. Depth: 2-1/2 inches (63.5 mm) where indicated.
- C. Deflection Track: Manufacturer's top runner complying with the requirements of ASTM C 645 and with 2-inch- (50.8-mm-) deep flanges.
- D. Deflection Track: Manufacturer's standard top runner designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M). Thickness as indicated for studs, and width to accommodate depth of studs, and of the following configuration:
 - 1. Top Runner with Compressible Flanges: 2-1/2-inch- (63.5-mm-) deep flanges with V-shaped offsets that compress when pressure is applied from construction above.
- E. Deflection and Firestop Track: Top runner designed to allow partition heads to expand and contract with movement of structure above while maintaining continuity of the assembly. Comply with requirements of ASTM C 645 except configuration, of thickness indicated for studs and width to accommodate depth of studs indicated with flanges offset at midpoint to accommodate gypsum board thickness.
- F. Z-Furring Members: Manufacturer's standard Z-shaped furring members with slotted or nonslotted web, fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M); with a minimum base metal (uncoated) thickness of 0.0179 inch (0.45 mm), face flange of 1-1/4 inch (31.8 mm), wall-attachment flange of 7/8 inch (22.2 mm), and of depth required to fit insulation thickness indicated.

- G. Steel Channel Bridging: Cold-rolled steel, 0.0598-inch (1.5-mm) minimum thickness of base (uncoated) metal and 7/16-inch- (11.1-mm-) wide flanges, 1-1/2 inches (38.1 mm) deep, 475 lb/1000 feet (45 kg/100 m), unless otherwise indicated.
- H. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M), length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
 - 1. Thickness: 0.0179 inch (0.45 mm), unless otherwise indicated.
- I. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.4 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
 - 1. Widths: Provide gypsum board in widths of 48 inches (1219 mm).
- B. Gypsum Wallboard: ASTM C 36 and as follows:
 - 1. Type: Type X where required for fire-resistance-rated assemblies – all gypsym board uses.
 - 2. Edges: Tapered.
 - 3. Thickness: 5/8 inch (15.9 mm) where indicated.
- C. Water-Resistant Gypsum Backing Board: ASTM C 630 and as follows:
 - 1. Type: Type X for fire-resistance-rated assemblies and where indicated.
 - 2. Thickness: 5/8 inch (15.9 mm), unless otherwise indicated.
- D. Gypsum Sheathing.
 - 1. ASTM C 931 square edges 5/8".

2.5 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
 - 1. Material: Formed metal or plastic, with metal complying with the following requirement:
 - a. Steel sheet zinc coated by hot-dip or electrolytic process, or steel sheet coated with aluminum or rolled zinc.
 - 2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:

- a. Cornerbead on outside corners, unless otherwise indicated.
 - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
 - c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
 - d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
 - e. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.
- B. Accessory for Curved Edges: Cornerbead formed of metal, plastic, or metal combined with plastic, with either notched or flexible flanges that are bendable to curvature radius.
- C. Accessories for Exterior Installations: Cornerbead, edge trim, and control joints formed from steel sheet zinc coated by hot-dip process or rolled zinc complying with ASTM C 1047, in shapes indicated below by reference to Fig. 1 designations in ASTM C 1047.
 - 1. Cornerbead on outside corners, unless otherwise indicated.
 - 2. Edge trim complying with shape LC-bead per Fig. 1, unless otherwise indicated.
 - 3. One-piece control joint formed from rolled zinc with V-shaped slot and removable strip covering slot opening.
- D. Aluminum Accessories: Where indicated, provide manufacturer's standard extruded-aluminum accessories of profile indicated complying with the following requirements:
 - 1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of finish indicated and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for alloy and temper 6063-T5.
 - a. Color: As selected by NAFI from manufacturer's standard colors.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering aluminum accessories that may be incorporated in the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. MM Systems, Inc.
 - c. Pittcon Industries, Inc.

2.6 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
 1. Ready-Mixed Formulation: Factory-mixed product.
 - a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
 - b. Topping compound formulated for fill (second) and finish (third) coats.
 - c. All-purpose compound formulated for both taping and topping compounds.

2.7 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.
- C. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
- D. Fastening Adhesive for Wood: ASTM C 557.
- E. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.
- F. Steel drill screws complying with ASTM C 1002 for the following applications:
 1. Fastening gypsum board to steel members less than 0.033 inch (0.84 mm) thick.
 2. Fastening gypsum board to wood members.
 3. Fastening gypsum board to gypsum board.
- G. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- H. Steel drill screws of size and type recommended by unit manufacturer for fastening cementitious backer units.
- I. Gypsum Board Nails: ASTM C 514.
- J. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.
- B. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, provide continuous units fastened to building structure not more than 24 inches (600 mm) o.c.
- C. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of gypsum board assemblies without reducing thickness of fireproofing below that is required to obtain fire-resistance rating indicated. Protect remaining fireproofing from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.
 - 1. Where building structure abuts ceiling perimeter or penetrates ceiling.
 - 2. Where partition framing and wall furring abut structure, except at floor.
 - a. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.
 - b. Install deflection track top runner to attain lateral support and avoid axial loading.
 - c. Install deflection and firestop track top runner at fire-resistance-rated assemblies where indicated.

- 1) Attach jamb studs at openings to tracks using manufacturer's standard stud clip.
- D. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

- A. Screw furring members to framing.
- B. Suspend ceiling hangers from building structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
 4. Secure flat, angle, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
 5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to steel deck tabs.
 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- C. Sway-brace suspended steel framing with hangers used for support.
- D. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.
1. Wire Hangers: 48 inches (1219 mm) o.c.
 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
 3. Furring Channels (Furring Members): 24 inches (610 mm) o.c.
- E. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) as measured both lengthwise on each member and transversely between parallel members.

- F. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
- G. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- H. For exterior soffits, install cross-bracing and additional framing to resist wind uplift according to details on drawings.

3.5 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
 - 2. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
- D. Terminate partition framing at deck for all walls unless shown otherwise.
- E. Install steel studs and furring in sizes and at spacings indicated.
 - 1. Single-Layer Construction: Space studs 24 inches (610 mm) o.c., unless otherwise indicated.
 - 2. Cementitious Backer Unit Construction: Space studs 16 inches (406 mm) o.c., unless otherwise indicated.
- F. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- G. For curved partitions, install steel framing as follows:

1. Cut top and bottom runners through leg and web at 2-inch (50-mm) intervals for arc length. In cutting lengths of runners, allow for uncut straight lengths of not less than 12 inches (300 mm) at ends of arcs.
 2. Bend runners to uniform curve of radius indicated and locate straight lengths so they are tangent to arcs.
 3. Support outside (cut) leg of runners by clinching a 1-inch- (25-mm-) high-by-0.0209-inch- (0.55-mm-) thick steel sheet strip to inside of cut legs using metal lock fasteners.
 4. Attach runners to structural elements at floor and ceiling with fasteners located 2 inches (50 mm) from ends and spaced 24 inches (610 mm) o.c.
 5. Position studs vertically with open sides facing in same direction and engaging floor and ceiling runners. Begin and end each arc with a stud and space intermediate studs equally along arcs at stud spacing recommended by gypsum board manufacturer for radii indicated. Attach studs to runners with 3/8-inch- (9.5-mm-) long pan head framing screws. On straight lengths at ends of arcs, place studs 6 inches (150 mm) o.c. with last stud left free standing.
- H. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
1. Install 2 studs at each jamb, unless otherwise indicated.
 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint.
 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- I. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite

sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.

- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Instead, float gypsum panels over these members using resilient channels or provide control joints to counteract wood shrinkage.
- I. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches (813 mm) wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
- J. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
- K. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
 - 1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- L. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- M. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.
- N. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- O. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.
- P. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.7 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
3. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistance-rated assemblies. Use maximum-length panels to minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 - b. At stairwells and other high walls, install panels horizontally.
4. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

B. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:

1. Install glass-mat, water-resistant gypsum backing board panels to comply with manufacturer's installation instructions at showers, tubs, and where indicated. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or penetrations.
2. Install glass-mat, water-resistant gypsum backing board panels to comply with manufacturer's installation instructions at locations indicated to receive wall tile. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or penetrations.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:

1. Fasten with screws.

D. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered over supports.

1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
 - 1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - 2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
 - 3. Install U-bead where indicated.
 - 4. Install aluminum trim and other accessories where indicated.
- D. Install control joints at locations indicated but not to exceed 30' o.c.
- E. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by NAFI for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
- D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
 - 1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - 2. Level 2 where panels form substrates for tile and where indicated.
 - 3. Level 2 for gypsum board where indicated.
 - 4. Level 3 for gypsum board where indicated.
 - 5. Level 4 for gypsum board surfaces, unless otherwise indicated.
 - 6. Level 5 for gypsum board surfaces where indicated.
- E. Finish glass-mat, water-resistant gypsum backing board to comply with gypsum board manufacturer's directions.
- F. Finish cementitious backer units to comply with unit manufacturer's directions.

3.10 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: NAFI will conduct an above-ceiling observation prior to installation of gypsum board ceilings and report any deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
 - 1. Notify NAFI one week in advance of the date and the time when the Project, or part of the Project, will be ready for an above-ceiling observation.
 - 2. Prior to notifying NAFI, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control air tubing.
 - f. Installation of ceiling support framing.

3.11 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09255

SECTION 09310 CERAMIC TILE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Quarry tile.
 - 2. Paver tile.
 - 3. Wall Tile.
 - 4. Glass Mosaic.
 - 5. Thresholds installed as part of tile installations.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
 - 2. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 3. Division 9 Section "Gypsum Board Assemblies" for cementitious backer units installed in gypsum wallboard assemblies.

1.3 DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).
- C. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 SUBMITTALS

- A. Product Data: For each type of tile, mortar, grout, and other products specified.
- B. Shop Drawings: For the following:
 - 1. Tile patterns and locations.
 - 2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Tile Samples for Initial Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for

each type and composition of tile indicated. Include Samples of accessories involving color selection.

- D. Grout Samples for Initial Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.
- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the ceramic tile installation schedules at the end of this Section. Maximum three colors of each product type in patterns.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Tile Products:
 - a. American Olean Tile Company
 - b. Crossville Ceramics.
 - c. Dal-Tile Corporation.
 - d. Florida Tile Industries, Inc.
 - e. Monarch Tile, Inc.
 - f. Summitville Tiles, Inc.
2. Tile-Setting and -Grouting Materials:
 - a. American Olean Tile Company.
 - b. Bonsal: W.R. Bonsal Company.
 - c. Bostik.
 - d. Dal-Tile Corporation.
 - e. DAP, Inc.
 - f. Laticrete International, Inc.
 - g. Summitville Tiles, Inc.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
1. Provide NAFI's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
 2. Provide tile trim and accessories that match color and finish of adjoining flat tile.
- D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

- A. Unglazed Quarry Tile: Provide square-edged flat tile complying with the following requirements:
 - 1. Basis of Design:
 - a. American Olean
 - b. Pattern: Quarry Tile
 - c. Color: Refer to Color Legend in drawings
 - 2. Wearing Surface: Abrasive aggregate embedded in surface.
 - 3. Facial Dimensions: 6 by 6 inches
 - 4. Thickness: 1/2 inch (9.5 mm).
 - 5. Face: Plain.

- B. Glazed Wall Tile. Provide flat tile complying with the following:
 - 1. Basis of Design:
 - a. American Olean
 - b. Pattern: Satin Bright Wall tile
 - c. Color: Refer to Color Legend in drawings
 - 2. Composition: Glazed Porcelain.
 - 3. Dimensions: 4-1/4 inch x 4-1/4 inch
 - 4. Thickness: 1/2 inch.

- C. Unglazed Floor Tile: Provide flat tile complying with the following:
 - 1. Basis of Design:
 - a. American Olean
 - b. Pattern: Domain
 - c. Color: Refer to Color legend in drawings
 - 2. Composition: Color Body Porcelain.
 - 3. Facial Dimensions: 12 x 12 (floor tile).
 - 4. Thickness: 3/8 inch.
 - 5. Face: Plain with square edges.

- D. Glass Mosaic Tile: Provide sheet mounted glass mosaic tile complying with the following:
 - 1. Basis of Design:
 - a. Vitrex Glass Mosaic Tile - Gold/Bronze
 - b. Color: Gold/Bronze Mix Rosso / Romato S
 - 2. Size: 3/4" x 3/4"
 - 3. Mesh Mounted
 - 4. Composition: Glass Mosaic Tile
Face: Plain, with square edge.

- E. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
 - 1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.

2.4 THRESHOLDS

- A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
 - 2. Fabricate thresholds to heights indicated, but not more than 1/2 inch (12.7 mm) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.
- B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.

2.5 SETTING MATERIALS

- A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
 - 1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

2.6 GROUTING MATERIALS

- A. Latex-Portland Cement Grout: ANSI A118.6 for materials described in Section H-2.4, composed as follows:
 - 1. Factory-Prepared, Dry-Grout Mixture: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to produce the following:
 - a. Sanded grout mixture for joints 1/8 inch (3.2 mm) and wider.

2.7 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.8 MISCELLANEOUS MATERIALS

Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

- B. Metal Edge Strips: White-zinc-alloy terrazzo strips, 1/8 inch (3.2 mm) wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with NAFI.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
 - 1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.

2. Remove protrusions, bumps, and ridges by sanding or grinding.

- C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- A. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles. Maximum spacing of 20'-0" o.c. each direction.
1. Locate joints in tile surfaces directly above joints in concrete substrates.
 2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
- G. Grout tile to comply with the requirements of the following tile installation standards:
1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.
- H. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.4 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.
- B. Joint Widths: Install tile on floors with the following joint widths:
 - 1. Quarry Tile: 1/4 inch (6.35 mm).
 - 2. Paver Tile: 1/4 inch (6.35 mm).
- C. Back Buttering: For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
 - 1. Tile floors in wet areas, including showers, tub enclosures, laundries, and swimming pools.
 - 2. Tile floors composed of tiles 8 by 8 inches (203 by 203 mm) or larger.
 - 3. Tile floors composed of rib-backed tiles.
- D. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
 - 1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.
- E. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove latex-portland cement grout residue from tile as soon as possible.
 - 2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensures tile is without damage or deterioration at the time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
 2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09310

SECTION 09511 ACOUSTICAL PANEL CEILINGS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes ceilings consisting of acoustical panels and exposed suspension systems.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of actual acoustical panels or sections of acoustical panels, suspension systems, and moldings showing the full range of colors, textures, and patterns available for each type of ceiling assembly indicated.
- C. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.
- D. Research/Evaluation Reports: Evidence of acoustical panel ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Ceiling Units: Obtain each acoustical ceiling panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated for each designation in the Acoustical Panel Ceiling Schedule at the end of Part 3.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

- C. Panel Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3, including those referencing ASTM E 1264 classifications.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.
- B. Metal Suspension System Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
 - 1. Postinstalled Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
- F. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
- H. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's product designations, including splice plates, corner pieces, and attachment and other clips, complying with the following requirements:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221/B 221M for alloy and temper 6063-T5.
2. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
3. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Comply with paint manufacturer's written instructions for applying and baking and for minimum dry film thickness.
 - a. Organic Coating: Manufacturer's standard thermosetting coating system with a minimum dry film thickness of 0.8 to 1.2 mils (0.02 to 0.03 mm).
 - b. Color: As selected by NAFI from manufacturer's standard colors.
4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.
 - b. Celotex Corporation (The); Building Products Division; Architectural Ceilings Marketing Dept.
 - c. Chicago Metallic Corporation.
 - d. Fry Reglet Corporation.
 - e. USG Interiors, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
 - 6. Do not attach hangers to steel deck tabs.
 - 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 8. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:
 - a. Install panels with pattern running in one direction parallel to short axis of space.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.
4. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 ACOUSTICAL PANEL CEILING SCHEDULE

- A. Manufacturers:
 1. Armstrong
 2. USG
 3. Or approved equal.
- B. Acoustic Panels: Conforming to the following:
 1. Size: 24" x 24" x 5/8" Mineral Fiber square lay-in
 2. Surface Finish: #1770, Armstrong Dune with Humiguard Plus Performance.
 3. UL Classified NRC:
 - b) .85 / 3/4" thick and AC 180 in all other areas.
- C. Moisture Resistant (Kitchen & Toilets):
 1. Size: 24" x 24" x 5/8" Clean Room VL square lay-in with Humiguard Plus Performance.
 2. UL Classified CAC 40.

END OF SECTION 09511

SECTION 09681 - CARPET (TILE)**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following.
 - 1. Carpet Tile (Modular)
- B. Related Sections include the following:
 - 1. Division 9 Section "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.
 - 2. Division 9 Section "Carpet".

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation methods.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge Stripping and Accessory: 12-inch-long Samples.
- C. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.
- D. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 1. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. **Fire-Test-Response Characteristics:** Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. **General:** Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. **General:** Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."
- B. **Environmental Limitations:** Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tile over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

1.7 WARRANTY

- A. **General Warranty:** Special warranty specified in this Article shall not deprive NAFI of other rights NAFI may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. **Special Carpet Tile Warranty:** Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 1. **Warranty Period:** 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are limited to one of the following:
 - A. Manufacturer: InterfaceFLOR
 - 1. Pattern: Super Flor
 - 2. Color: Manufacturer's Full Range
 - 3. Fiber Content: 82.5% Nylon, 17.5% Polyester
 - 4. Construction: Hair Tile (Needlepunch)
 - 5. Density: 8,945 oz./cu. yd.
 - 6. Pile Thickness: .165
 - 7. Total Weight: 41 oz./sy
 - 8. Backing: Synthetic: InterfaceFLOR standard backing system for modular tile
 - 9. Size: 24" x 24"

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and that is recommended by carpet tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Verify that substrates and conditions are satisfactory for carpet tile installation and comply with requirements specified.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 13, "Carpet Modules (Tiles)."
- B. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- C. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- E. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 15, "Protection of Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09681

SECTION 09900 PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed exterior items and surfaces.
 - 2. Exposed interior items and surfaces.
 - 3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the NAFI will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork and casework.
 - b. Lockers.
 - c. Finished mechanical and electrical equipment.
 - d. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.

3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
1. Division 5 Section "Structural Steel" for shop priming structural steel.
 2. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
 3. Division 6 Section "Interior Architectural Woodwork" for shop priming interior Architectural woodwork.
 4. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
 5. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.

1. **Material List:** Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. **Manufacturer's Information:** Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 3. **Certification** by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. **Samples for Initial Selection:** Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1.5 QUALITY ASSURANCE

- A. **Applicator Qualifications:** Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. **Source Limitations:** Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. **Benchmark Samples (Mockups):** Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
1. The NAFI will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
 - a. **Wall Surfaces:** Provide samples on at least 100 sq. ft. (9 sq. m) of wall surface.
 - b. **Small Areas and Items:** The NAFI will designate an item or area as required.
 2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, the NAFI will use the room or surface to evaluate coating systems of a similar nature.
 3. Final approval of colors will be from job-applied samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
1. Product name or title of material.

2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.
- B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
 1. Devoe / I.C.I. (Devoe).
 2. Benjamin Moore & Co. (Moore).
 3. Pratt & Lambert, Inc. (P & L).
 4. Sherwin-Williams Co. (S-W).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Match colors indicated by reference to manufacturer's color designations.
- D. Colors: Provide color selections made by the NAFI.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the NAFI about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. When transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 - 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

- a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
- 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 3. Provide finish coats that are compatible with primers used.
 - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 - 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
 10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Piping, pipe hangers, and supports.
 2. Heat exchangers.
 3. Tanks.
 4. Ductwork.
 5. Insulation.
 6. Motors and mechanical equipment.
 7. Accessory items.
- G. Electrical items to be painted include, but are not limited to, the following:

1. Conduit and fittings.
2. Switchgear.
3. Panelboards.

- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by NAFI.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

A. Smooth Wood: Provide the following finish systems over smooth wood siding and other smooth, exterior wood surfaces:

1. Low-Luster Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Exterior, alkyd or latex, wood primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).
 - 1) Devoe: 1102 All-Weather Exterior Alkyd House Paint Primer.
 - 2) Moore: Moorwhite Primer #100.
 - 3) P & L: S/D 1002 Suprime "2" Exterior Latex Wood Primer.
 - b. First and Second Coats: Low-sheen (eggshell or satin), exterior, latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.3 mils (0.058 mm).
 - 1) Devoe: 16XX Wonder-Shield Exterior Acrylic Latex Satin House and Trim Paint.
 - 2) Moore: MoorGard Latex House Paint #103.
 - 3) P & L: Z/F 1800 Series Aqua-Shell Exterior Latex Eggshell Paint.

B. Wood Trim: Provide the following finish systems over exterior wood trim:

1. Medium-Shade, Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Exterior, alkyd or latex, wood primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - 1) Devoe: 1102 All-Weather Exterior Alkyd House Paint Primer.
 - 2) Moore: Moorwhite Primer #100.
 - 3) P & L: S/D 1002 Suprime "2" Exterior Latex Wood Primer.
 - 4) S-W: WeatherPerfect Exterior Wood Undercoater Y24W538.
 - b. First and Second Coats: Full-gloss, waterborne, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
 - 1) Devoe: 18XX Wonder-Shield Exterior Acrylic Latex Gloss House and Trim Paint.
 - 2) Moore: Impervex Enamel #309.
 - 3) P & L: Z/F 4300 Series Accolade Exterior Gloss.
 - 4) S-W: DTM Acrylic Coating Gloss (Waterborne) B66W100 Series.

C. Stained Wood: Provide the following stain finish systems over exterior wood:

1. Flat Acrylic Finish: One-coat, waterborne, semitransparent, penetrating wood stain.
 - a. First Coat: Semitransparent, exterior, acrylic-latex, wood stain applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: 91XX All-Weather Waterborne Semi-Transparent Stain.
 - 2) Moore: Moorwood Acrylic Semi-Transparent Stain #93
 - 3) P & L: Z 87 STAINShield Penetrating Latex Rustic Stain.
- D. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
 1. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).
 - 1) Devoe: 13101 Mirrolac Rust Penetrating Metal Primer.
 - 2) Moore: Retard-X Rust-Inhibitive Latex Primer #162.
 - 3) P & L: S/D 1009 Suprime "9" Interior/Exterior Alkyd Metal Primer.
 - 4) S-W: Kem Kromik Metal Primer B50N2/B50W1.
 - b. First and Second Coats: Full-gloss, waterborne, acrylic enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
 - 1) Devoe: 84XX Mirrolac-WB Interior-Exterior Waterborne High Gloss Enamel.
 - 2) Moore: Impervex Enamel #309.
 - 3) P & L: Z/F 2900 Series Enducryl Acrylic Maintenance Enamel.
 - 4) S-W: DTM Acrylic Coating Gloss (Waterborne) B66W100 Series.
- E. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:
 1. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a galvanized metal primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - 1) Devoe: 8502/8520 Mirrolac-WB Interior/Exterior Waterborne Flat DTM Primer and Finish.
 - 2) Moore: IronClad Galvanized Metal Latex Primer #155.
 - 3) P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.
 - 4) S-W: DTM Acrylic Primer/Finish B66W1.

- b. First and Second Coats: Full-gloss, waterborne, acrylic enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
 - 1) Devoe: 84XX Mirrolac-WB Interior-Exterior Waterborne High Gloss Enamel.
 - 2) Moore: Impervex Enamel #309.
 - 3) P & L: Z/F 2900 Series Enducryl Acrylic Maintenance Enamel.
 - 4) S-W: DTM Acrylic Coating Gloss (Waterborne) B66W100 Series.

3.7 INTERIOR PAINT SCHEDULE

- A. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units:

- 1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a block filler.
 - a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils (0.13 mm).
 - 1) Devoe: 52902 Bloxfil 200 Interior/Exterior Latex Block Filler.
 - 2) Moore: Moorcraft Interior & Exterior Block Filler #173.
 - 3) P & L: Z 98 Pro-Hide Plus Latex Block Filler.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
 - 1) Devoe: 34XX Wonder-Tones Interior Latex Eggshell Enamel.
 - 2) Moore: Moore's Regal AquaVelvet #319.
 - 3) P & L: Z/F 4000 Series Accolade Interior Velvet.

- B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

- 1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - 1) Devoe: 50801 Wonder-Tones Interior Vinyl Latex Primer-Sealer.
 - 2) Moore: Regal First Coat Interior Latex Primer & Underbody #216.
 - 3) P & L: Z/F 1004 Suprime "4" Interior Latex Wall Primer.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).

- 1) Devoe: 34XX Wonder-Tones Interior Latex Eggshell Enamel.
- 2) Moore: Moore's Regal AquaVelvet #319.
- 3) P & L: Z/F 4000 Series Accolade Interior Velvet.

C. Gypsum Board Epoxy: Two (2) finish coats over primer.

1. Primer and Finish Coats: Equal to Sherwin Williams Armor Tile Polyester Epoxy B67 Series.

D. Woodwork and Hardboard: Provide the following paint finish systems over new, interior wood surfaces:

1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.
 - a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - 1) Devoe: 51701 Wonder-Prime All-Purpose Latex Primer Sealer & Vapor Barrier.
 - 2) Moore: Moore's Alkyd Enamel Underbody #217.
 - 3) P & L: Z/F 1001 Suprime "1" 100 Percent Acrylic Multi-Purpose Primer.
 - b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
 - 1) Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
 - 2) Moore: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
 - 3) P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.

E. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).
 - 1) Devoe: 13101 Mirrolac Rust Penetrating Metal Primer.
 - 2) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
 - 3) P & L: S 4551 Tech-Gard High Performance Rust Inhibitor Primer.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
 - 1) PPG: 89 Lineor Man Hall Eggshell Latex Wall and Trim Paint.

- 2) Devoe: 34XX Wonder-Tones Interior Latex Eggshell Enamel.
- 3) Moore: Moore's Regal AquaVelvet #319.
- 4) P & L: Z/F 4000 Series Accolade Interior Velvet.

F. Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal:

1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

- 1) Devoe: 13201 Mirrolac Galvanized Metal Primer.
- 2) Moore: IronClad Galvanized Metal Latex Primer #155.
- 3) P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.

b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).

- 1) Devoe: 34XX Wonder-Tones Interior Latex Eggshell Enamel.
- 2) Moore: Moore's Regal AquaVelvet #319.
- 3) P & L: Z/F 4000 Series Accolade Interior Velvet.

END OF SECTION 09900

DIVISION 10 - SPECIALTIES

10155	TOILET COMPARTMENTS
10300	MANUFACTURED ELECTRIC FIREPLACES
10425	SIGNS
10520	FIRE-PROTECTION SPECIALTIES
10801	TOILET AND BATH ACCESSORIES

SECTION 10155 TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes toilet compartments and screens as follows:
 - 1. Type: Solid-plastic, polymer resin.
 - 2. Compartment Style: Overhead braced and floor anchored.
 - 3. Screen Style: Wall hung.
- B. Related Sections include the following:
 - 1. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

- A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units with-

out field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Capitol Partitions, Inc.
 - 2. Compression Polymers Group; Comtec Industries.
 - 3. General Partitions Mfg. Corp.
 - 4. Metpar Corp.
 - 5. Partition Systems, Inc.; Columbia Partitions.
 - 6. Santana Products, Inc.

2.2 MATERIALS

- A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.
- B. Solid-Plastic, Polymer Resin: High-density polyethylene (HDPE) with homogenous color throughout. Provide material not less than 1 inch (25 mm) thick with seamless construction and eased edges in color and pattern as follows:
 - 1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.
- C. Pilaster Shoes and Sleeves (Caps): 3 inches (75 mm) high.
- D. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:
 - 1. Material: Solid Plastic.
- E. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
 - 1. Material: Clear-anodized aluminum.
- F. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.

- G. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
- B. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be handicapped accessible.
 - 1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees. Continuous hinges.
 - 2. Latch and Keeper: Recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
 - 3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 - 4. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
- B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

- C. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10155

SECTION 10300 - MANUFACTURED ELECTRIC FIREPLACES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured electric fireplaces.
- B. Accessories.

1.2 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Wood framed rough opening and enclosure.
- B. Section 16000 – Electrical; for utility requirements.

1.3 REFERENCES

- A. UL - Underwriters Laboratories Inc. Standards of Safety for Electrical Equipment.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- D. Manufacturers warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

1.6 WARRANTY

- A. **Provide the manufacturers' 2-year limited warranty from date of substantial completion on electrical components.**

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Lennox
- B. Heat-N-Glo
- C. Quadra-Fire

- D. Or approved equal.

2.2 ELECTRIC FIREPLACES

- A. General:
 - 1. Provide all components and accessories required for a complete, functional unit.
 - 2. UL or WHI listed.
- B. Fireplace: Front view; opening 27 inches wide by 17 inches high; glass door; clean face. Standard 5,000 btu/120V heater.
 - 1. Venting: Non Venting.
 - 2. Heating: Louverless Circulating.
 - 3. Liner: Smokey Bronze color.
 - 4. Standard Features:
 - a. Fire on/off.
 - b. Ember bed on/off.
 - c. Two-speed selectable flame presentation.
 - d. Flame brightness, color and contrast.
 - e. On-demand forced-air heater.
 - f. Hand held remote control.
 - g. 120V Power Cord.
 - h. On/off Switch mounted on unit.
 - 5. Split Oak log set and log grate.
 - 6. Glass Panels: Bronze tinted flush glass door.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify NAFI of unsatisfactory preparation before proceeding.
- C. Verify proper power supply and fuel source are available.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.
- B. Use manufacturer's guidelines for minimum clearances to combustibles, walls, and finishes.
- C. Anchor all components firmly in position for long life under hard use.

- D. Upon completion of installation, visually inspect all exposed surfaces. Touch up scratches and abrasions with touch up paint recommended by the manufacturer; make imperfections invisible to the unaided eye from a distance of 5 feet (1.5 m).

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 10300

SECTION 10425 SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following types of signs:
 1. Wall signs.
 2. Dimensional letters and numbers.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
 1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 1. Samples for initial selection of color, pattern, and texture:
 - a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.
 - b. Aluminum: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Manufacturers of Panel Signs:
 - a. APCO Graphics, Inc.
 - b. ASI Sign Systems, Inc.
 - c. Best Manufacturing Company.
 - d. Mohawk Sign Systems.
 - e. Vomar Products, Inc.
 - 2. Manufacturers of Dimensional Letters:
 - a. A.R.K. Ramos Manufacturing Company, Inc.
 - b. ASI Sign Systems, Inc.
 - c. Matthews International Corp.
 - d. Metal Arts.
 - e. Metallic Arts, Inc.
 - 3. Manufacturers of Cast Plaques:
 - a. A.R.K. Ramos Manufacturing Company, Inc.
 - b. ASI Sign Systems, Inc.
 - c. Best Manufacturing Company.
 - d. Matthews International Corp.
 - e. Metal Arts.
 - f. Metallic Arts, Inc.

2.2 MATERIALS

- A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790, with a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:
 - 1. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested according to the requirements of ASTM D 1003.
 - 2. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.

- B. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
- C. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- D. Bronze Castings: Provide bronze castings, copper alloy UNS C83600, complying with the requirements of ASTM B 584.
- E. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- F. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
- G. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.

2.3 PANEL SIGNS

- A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
 - 2. Conform to ADA standards.
- B. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:
 - 1. Edge Condition: Square cut.
 - 2. Corner Condition: Square corners.
- C. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer's standard process.
- D. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
- E. Engraved Copy: Machine-engrave letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a

pantographic system or equivalent process capable of producing characters of the style indicated with sharply formed edges.

1. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with enamel. Apply opaque background color coating to the back face of acrylic sheet.
 - a. Engrave the copy to produce a minimum indentation depth of 1/32 inch and a minimum stroke width of 1/4 inch.
- F. Subsurface Copy: Apply copy to the back face of clear acrylic sheet forming the panel face by process indicated to produce precisely formed opaque images free from rough edges.
 1. Use reverse silk-screen process to print copy; overspray the copy with an opaque background color coating.

2.4 DIMENSIONAL LETTERS AND NUMBERS

- A. Cast Letters and Numbers: Form individual letters and numbers by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.
 1. Metal: Aluminum.

2.7 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the NAFI from the manufacturer's standards.
- B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.
- C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
 1. Baked-Enamel Finish: AA-M4xC12C42R1x (Mechanical Finish: Manufacturer's standard, other nondirectional textured; Chemical Finish: Chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.
 - a. Organic Coating: Thermosetting-modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils, medium gloss.

- 1) Color: As indicated by reference to the manufacturer's standard color designations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
 1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
- C. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
 1. Flush Mounting: Mount letters with backs in contact with the wall surface.
- D. Cast Metal Plaques: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.
 1. Concealed Mounting: Mount the plaques by inserting threaded studs into tapped lugs on the back of the plaque. Set in predrilled holes filled with quick-setting cement.

3.2 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the NAFI.

3.3 SCHEDULE

- A. Handicap Wall Signs
 1. 9" x 9" with male or female and handicap symbol plus 2 lines of graphics and Braille.
 2. Quantity 4.
- B. Building Letters

1. Flat – Roman style
2. 18" high, 18 letters.
3. 8" High, 12 Letters.

END OF SECTION 10425

SECTION 10520 FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
 - 3. Show location of knockouts for hose valves.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.
 - 1. Size: 6-by-6-inch- (150-by-150-mm-) square Samples.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

1.5 COORDINATION

- A. Coordinate size of cabinets to ensure that type and capacity of fire extinguishers indicated and provided by NAFI under separate Contract are accommodated.
- B. Coordinate size of cabinets to ensure that type and capacity of hoses, hose valves, and hose racks indicated are accommodated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Portable Fire Extinguishers:
 - a. J.L. Industries, Inc.
 - b. Larsen's Manufacturing Company.
 - c. Potter-Roemer; Div. of Smith Industries, Inc.
 - 2. Fire-Protection Cabinets:
 - a. J.L. Industries, Inc.
 - b. Larsen's Manufacturing Company.
 - c. Potter-Roemer; Div. of Smith Industries, Inc.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.
- B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - 1. Sheet: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
- B. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, in enameled-steel container.
- C. Carbon-Dioxide Type: UL-rated 10-B:C, 10-lb (4.5-kg) nominal capacity, in manufacturer's standard enameled-metal container.

2.4 FIRE-PROTECTION CABINETS

- A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
 - 1. Fire-Rated Cabinets: Listed and labeled to meet requirements of ASTM E 814 for fire-resistance rating of wall where it is installed.
 - a. Construct fire-rated cabinets with double walls fabricated from 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.
 - b. Provide factory-drilled mounting holes.
 - 2. Cabinet Metal: Enameled-steel sheet.
- B. Cabinet Type: Suitable for the following:
 - 1. Fire extinguisher.
- C. Cabinet Mounting: Suitable for the following mounting conditions:
 - 1. Semirecessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.
- D. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
 - 1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - a. Rolled-Edge Trim: 4-1/2-inch (114-mm) backbend depth.
- E. Cabinet Trim Material: Manufacturer's standard, as follows:
 - 1. Steel sheet.
- F. Door Material: Manufacturer's standard, as follows:
 - 1. Steel sheet.
- G. Door Glazing: Manufacturer's standard, as follows:
 - 1. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, as follows:
 - a. Class 1 (clear).
- H. Door Style: Manufacturer's standard design, as follows:
 - 1. Fully glazed panel with frame.

- I. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
 - 1. Provide minimum 1/2-inch- (13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
- J. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.5 ACCESSORIES

- A. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by NAFI.
 - 1. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
 - a. Application Process: Silk-screened.

2.6 COLORS AND TEXTURES

- A. Colors and Textures: As selected by NAFI from manufacturer's full range for these characteristics.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:
 - 1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
 - 2. Interior of cabinets and doors.
- E. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating;

Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.
2. Color: As selected by NAFI from manufacturer's full range.

2.8 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
 1. Color and Gloss: As selected by NAFI from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for cabinets to verify actual locations of connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets are to be installed.
- C. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire-protection specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
 2. Fasten mounting brackets to structure and cabinets, square and plumb.
 3. Fasten cabinets to structure, square and plumb.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust cabinet doors that do not swing or operate freely.
- B. Refinish or replace cabinets and doors damaged during installation.
- C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10520

SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Grab bars.
2. Toilet paper dispenser.
3. Paper towel dispenser.
4. Mirror.
5. Soap dispenser.
6. Mop/broom holder.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
 1. Toilet and Bath Accessories:

- a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
 - c. McKinney/Parker Washroom Accessories Corp.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.
- C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
- E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
- F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.
- G. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- H. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

- A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

- C. **Framed Glass-Mirror Units:** Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- D. **Mirror-Unit Hangers:** Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
- E. **Keys:** Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six keys to NAFI's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

- A. **Paper Towel Dispenser/Waste Receptacle:** Where this designation is indicated, provide stainless-steel paper towel dispenser, complying with the following:
 - 1. Products: Bobrick #B-3961.

- B. Toilet Tissue Dispenser: Where this designation is indicated, provide toilet tissue dispenser, complying with the following:
 - 1. Products: Bobrick #B-2888.
- C. Soap Dispenser : Where this designation is indicated, provide soap dispenser, complying with the following:
 - 1. Products: Bobrick #B-2112.
- D. Grab Bar : Where this designation is indicated, provide stainless-steel grab bar, complying with the following:
 - 1. Products: Bobrick #B-6806.
- E. Mirror Unit : Where this designation is indicated, provide mirror unit, complying with the following:
 - 1. Products: Bobrick #B-165 – 2436.
- F. Mop/Broom Holder: Where this designation is indicated, provide mop/broom holder, complying with the following:
 - 1. Products: Bobrick #B-223 x 36.

END OF SECTION 10801

DIVISION 11 - EQUIPMENT

11400 FOOD SERVICE EQUIPMENT

FOOD SERVICE EQUIPMENT SCHEDULE / SPECIFICATIONS

SECTION 11400 FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including RFP Sections and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes food service equipment indicated on Drawings and schedules.
- B. NAFI-Furnished Equipment: Where indicated, NAFI will furnish equipment items.
- C. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for equipment supports.
 - 2. Division 6 Section "Interior Architectural Woodwork" for wood casework and plastic-laminate substrates.
 - 3. Refer to Division 15 Sections for supply and exhaust fans; exhaust ductwork; service roughing-ins; drain traps; atmospheric vents; valves, pipes, and fittings; fire-extinguishing systems; and other materials required to complete food service equipment installation.

1.3 DEFINITIONS

- A. Terminology Standard: Refer to NSF 2, "Food Equipment" or other applicable NSF standards for definitions of food service equipment and installation terms not otherwise defined in this Section or in other referenced standards.

1.4 SUBMITTALS

- A. Product Data: For each type of food service equipment indicated. Include manufacturer's model number and accessories and requirements for access and maintenance clearances, water and drainage, power or fuel, and service-connections including roughing-in dimensions.
- B. Shop Drawings: For food service equipment not manufactured as standard production and catalog items by manufacturers. Include plans, elevations, sections, roughing-in dimensions, fabrication details, service requirements, and attachments to other work.

1. Wiring Diagrams: Details of wiring for power, signal, and control systems and differentiating between manufacturer-installed and field-installed wiring.
 2. Piping Diagrams: Details of piping systems and differentiating between manufacturer-installed and field-installed piping.
- C. Coordination Drawings: For locations of food service equipment and service utilities. Key equipment with item numbers and descriptions indicated in Contract Documents. Include plans and elevations of equipment, access- and maintenance-clearance requirements, details of concrete or masonry bases and floor depressions, and service-utility characteristics.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for exposed products with color finishes.
- E. Samples for Verification: Of each type of exposed finish required, minimum 4-inch- (100-mm-) square or 6-inch- (150-mm-) long sections of linear shapes and of same thickness and material indicated for work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- F. Product Certificates: Signed by manufacturers of refrigeration systems or their authorized agents certifying that systems furnished comply with requirements and will maintain operating temperatures indicated in the areas or equipment that they will serve.
- G. Maintenance Data: Operation, maintenance, and parts data for food service equipment to include in the maintenance manuals specified in Division 1. Include a product schedule as follows:
1. Product Schedule: For each food service equipment item, include item number and description indicated in Contract Documents, manufacturer's name and model number, and authorized service agencies' addresses and telephone numbers.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing food service equipment, who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing food service equipment similar to that indicated for this Project and with a record of successful in-service performance.
- C. Source Limitations: Obtain each type of food service equipment through one source from a single manufacturer.
- D. Product Options: Drawings indicate food service equipment based on the specific products indicated. Other manufacturers' equipment with equal size and performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

- E. Regulatory Requirements: Comply with the following National Fire Protection Association (NFPA) codes:
 - 1. NFPA 17, "Dry Chemical Extinguishing Systems."
 - 2. NFPA 17A, "Wet Chemical Extinguishing Systems."
 - 3. NFPA 54, "National Fuel Gas Code."
 - 4. NFPA 70, "National Electrical Code."
 - 5. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."
- F. Listing and Labeling: Provide electrically operated equipment or components specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- G. AGA Certification: Provide gas-burning appliances certified by the American Gas Association (AGA).
- H. ASME Compliance: Fabricate and label steam-generating and closed steam-heating equipment to comply with ASME Boiler and Pressure Vessel Code.
- I. ASHRAE Compliance: Provide mechanical refrigeration systems complying with the American Society of Heating, Refrigerating and Air-Conditioning Engineers' ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- J. NSF Standards: Comply with applicable NSF International (NSF) standards and criteria and provide NSF Certification Mark on each equipment item, unless otherwise indicated.
- K. ANSI Standards: Comply with applicable ANSI standards for electric-powered and gas-burning appliances; for piping to compressed-gas cylinders; and for plumbing fittings, including vacuum breakers and air gaps, to prevent siphonage in water piping.
- L. SMACNA Standard: Where applicable, fabricate food service equipment to comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Kitchen Equipment Fabrication Guidelines," unless otherwise indicated.
- M. Seismic Restraints: Provide seismic restraints for food service equipment according to the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Kitchen Equipment Fabrication Guidelines," appendix 1, "Guidelines for Seismic Restraints of Kitchen Equipment," unless otherwise indicated.

- N. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
- O. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Review methods and procedures related to food service equipment including, but not limited to, the following:
 - 1. Review access requirements for equipment delivery.
 - 2. Review equipment storage and security requirements.
 - 3. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - 4. Review structural loading limitations.
 - 5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver food service equipment as factory-assembled units with protective crating and covering.
- B. Store food service equipment in original protective crating and covering and in a dry location.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of food service equipment installation areas by field measurements before equipment fabrication and indicate measurements on Shop Drawings and Coordination Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish required dimensions and proceed with fabricating equipment without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate equipment layout and installation with other work, including light fixtures, HVAC equipment, and fire-suppression system components.
- B. Coordinate location and requirements of service-utility connections.

- C. Coordinate size, location, and requirements of concrete bases, positive slopes to drains, floor depressions, and insulated floors. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- D. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

1.9 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the NAFI of other rights the NAFI may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Refrigeration Compressor Warranty: Submit a written warranty signed by manufacturer agreeing to repair or replace compressors that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 - 1. Breakage.
 - 2. Faulty operation.
- C. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304, stretcher leveled, and in finish specified in "Stainless-Steel Finishes" Article.
- B. Stainless-Steel Tube: ASTM A 554, Grade MT-304, and in finish specified in "Stainless-Steel Finishes" Article.
- C. Zinc-Coated Steel Sheet: ASTM A 653, G115 (ASTM A 653M, Z350) coating designation; commercial quality; cold rolled; stretcher leveled; and chemically treated.
- D. Zinc-Coated Steel Shapes: ASTM A 36 (ASTM A 36M), zinc-coated according to ASTM A 123 requirements.
- E. Plastic Laminate: Complying with NEMA LD 3 and NSF 35 requirements; NSF certified for end-use application indicated; 0.050 inch (1.27 mm) thick for horizontal and vertical surfaces and 0.042 inch (1.07 mm) thick for post-formed surfaces; smooth texture; and easily cleanable.
 - 1. Color: As selected by NAFI from manufacturer's full range of colors.
- F. Plywood and Lumber: Provide plywood and lumber as specified in Division 6 Section "In-

terior NAFlural Woodwork."

- G. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Provide elastomeric sealant NSF certified for end-use application indicated. Provide sealant that, when cured and washed, meets requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food.
 - 1. Color: As selected by NAFI from manufacturer's full range of colors.
 - 2. Backer Rod: Closed-cell polyethylene, in diameter larger than joint width.
- H. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear), Quality q3 (glazing select). Provide products complying with ANSI Z97.1, manufactured by horizontal (roller-hearth) process, and 6 mm thick, unless otherwise indicated. Provide exposed safety edges, if any, seamed before tempering.
- I. Plastic: Except for plastic laminate, provide plastic materials and components complying with NSF 51.
- J. Sound Dampening: NSF-certified, nonabsorbent, hard-drying, sound-deadening coating. Provide coating compounded for permanent adhesion to metal in 1/8-inch (3-mm) thickness that does not chip, flake, or blister.
- K. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene, or PVC that is nontoxic, stable, odorless, nonabsorbent, and unaffected by exposure to foods and cleaning compounds.

2.2 ACCESSORIES

- A. Cabinet Hardware: Provide NSF-certified, stainless-steel hardware for equipment items as indicated.
- B. Casters: NSF-certified, standard-duty, stainless-steel, swivel stem casters with 5-inch- (125-mm-) diameter wheels, polyurethane tires with 1-inch (25-mm) tread width, and 200-lb (90-kg) load capacity per caster. Provide brakes on 2 casters per unit.

2.3 FABRICATION, GENERAL

- A. Fabricate food service equipment according to NSF 2 requirements. Factory assemble equipment to greatest extent possible.
- B. Plastic-Laminate and Wood Casework: Fabricate according to requirements specified in Division 6 Section "Interior Architectural Woodwork."
- C. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Provide ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.

1. Welded Butt Joints: Provide full-penetration welds for full-joint length. Make joints flat, continuous, and homogenous with sheet metal without relying on straps under seams, filling in with solder, or spot welding.
 2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.
 3. Where fasteners are welded to underside of equipment, finish reverse side of weld smooth and undepressed.
 4. Coat unexposed stainless-steel welded joints with suitable metallic-based paint to prevent corrosion.
 5. After zinc-coated steel is welded, clean welds and abraded areas and apply SSPC-Paint 20, high-zinc-dust-content, galvanizing repair paint to comply with ASTM A 780.
- D. Fabricate field-assembled equipment prepared for field-joining methods indicated. For metal butt joints, comply with referenced SMACNA standard, unless otherwise indicated.
 - E. Where stainless steel is joined to a dissimilar metal, use stainless-steel welding material or fastening devices.
 - F. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.
 - G. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.
 - H. Provide surfaces in food zone, as defined in NSF 2, free from exposed fasteners.
 - I. Cap exposed fastener threads, including those inside cabinets, with stainless-steel lock washers and stainless-steel cap (acorn) nuts.
 - J. Provide pipe slots on equipment with turned-up edges and sized to accommodate service and utility lines and mechanical connections.
 - K. Provide enclosures, including panels, housings, and skirts, to conceal service lines, operating components, and mechanical and electrical devices including those inside cabinets, unless otherwise indicated.
 - L. Seismic Restraints: Fabricate to comply with referenced SMACNA standard, unless otherwise indicated.

2.4 STAINLESS-STEEL EQUIPMENT

- A. Edges and Backsplashes: Provide equipment edges and backsplashes indicated complying with referenced SMACNA standard, unless otherwise indicated.

- B. Apply sound dampening to underside of metal work surfaces, including sinks and similar units. Provide coating with smooth surface and hold coating 1 inch (25 mm) back from open edges for cleaning.
- C. Tables: Fabricate with reinforced tops, legs, and reinforced undershelves or cross bracing to comply with referenced SMACNA standard, unless otherwise indicated, and as follows:
 - 1. Tops: Minimum 0.0781-inch- (1.984-mm-) thick stainless steel, unless otherwise indicated.
 - 2. Legs: 1-5/8 inch (41.3 mm) OD, minimum 0.0625-inch- (1.588-mm-) thick stainless steel with stainless-steel gusset and adjustable insert bullet-type feet with minimum adjustment of 1 inch (25 mm) up or down without exposing threads, unless otherwise indicated.
 - 3. Undershelves: Minimum 0.625-inch- (1.588-mm-) thick stainless steel, unless otherwise indicated.
 - 4. Top and Undershelf Reinforcement: Provide minimum 0.0781-inch- (1.984-mm-) thick, stainless-steel reinforcing, unless otherwise indicated.
 - 5. Cross Bracing: 1-1/4 inch (31.75 mm) OD, minimum 0.0625-inch- (1.588-mm-) thick stainless steel, unless otherwise indicated.
- D. Sinks: Fabricate of minimum 0.0781-inch- (1.984-mm-) thick stainless steel with fully welded, 1-piece construction. Construct 2 sides and bottom of sink compartment from 1 stainless-steel sheet with ends welded integral and without overlapping joints or open spaces between compartments. Provide double-wall partitions between compartments with 1/2-inch- (13-mm-) radius rounded tops that are welded integral with sink body. Cove horizontal, vertical, and interior corners with 3/4-inch (19-mm) radius. Pitch and crease sinks to waste for drainage without pooling. Seat wastes in die-stamped depressions without solder, rivets, or welding.
 - 1. Wastes: 2-inch (50-mm) nickel-plated bronze, rotary-handle waste assembly with stainless-steel strainer plate and nickel-plated brass, connected overflow.
 - 2. Drainboards: Minimum 0.0781-inch- (1.984-mm-) thick stainless steel, pitched to sink at 1/8 inch/12 inches (3 mm/300 mm) of length. Reinforce drainboards with minimum 0.0781-inch- (1.984-mm-) thick stainless steel, unless otherwise indicated.
 - 3. Legs: 1-5/8 inch (41.3 mm) OD, minimum 0.0625-inch- (1.588-mm-) thick stainless steel with stainless-steel gusset welded to 0.1094-inch- (2.779-mm-) thick, stainless-steel support plate. Provide adjustable insert bullet-type feet with minimum adjustment of 1 inch (25 mm) up or down without exposing threads, unless otherwise indicated.
 - 4. Drainboard Braces: 1 inch (25 mm) OD, minimum 0.0625-inch- (1.588-mm-) thick stainless steel, unless otherwise indicated.

5. Cross Bracing: 1-1/4 inch (31.75 mm) OD, minimum 0.0625-inch- (1.588-mm-) thick stainless steel, unless otherwise indicated.
- E. Wall Shelves and Overshelves: Fabricate to comply with referenced SMACNA standard, unless otherwise indicated, and with minimum 0.0625-inch- (1.588-mm-) thick, stainless-steel shelf tops.
- F. Drawers: Provide lift-out type, 1-piece, die-stamped drawer pan fabricated from 0.050-inch- (1.27-mm-) thick stainless steel with inside corners radiused. Support drawer pan with 0.0625-inch- (1.588-mm-) thick, stainless-steel channel frame welded to drawer front. Provide 1-inch- (25-mm) thick, double-wall front fabricated from 0.0625-inch- (1.588-mm-) thick stainless steel and with integral recessed pull. Fill void in drawer front with semirigid fiberglass sound dampening. Mount drawers on NSF-certified, full-extension, stainless-steel drawer slides that have minimum 100-lb (45-kg) load capacity per pair, ball-bearing rollers, and positive stop. Mount drawer slides for self-closing on drawer housing as indicated.

2.5 EXHAUST HOOD FABRICATION

- A. General: Fabricate hoods indicated from minimum 0.050-inch- (1.27-mm-) thick stainless steel, unless otherwise indicated. Comply with NFPA 96 and requirements of authorities having jurisdiction.
 1. Refer to Division 15 Sections for duct, fan, damper, and fire-extinguishing system requirements.
- B. Grease Removal: Provide removable, stainless-steel, baffle-type grease filters with spring-loaded fastening. Provide minimum 0.0781-inch- (1.984-mm-) thick, stainless-steel filter frame and removable collection basins or troughs.
- C. Light Fixtures: Provide NSF-certified fixtures with lamps, vapor-tight sealed lenses, and wiring in stainless-steel conduit on hood exterior.
- D. Exhaust-Duct Collars: Minimum 0.0625-inch- (1.588-mm-) thick stainless steel.

2.6 STAINLESS-STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
 1. Remove or blend tool and die marks and stretch lines into finish.
 2. Grind and polish surfaces to produce uniform, directional textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Concealed Surfaces: No. 2B finish (bright, cold-rolled, unpolished finish).
- C. Exposed Surfaces: No. 4 finish (bright, directional polish).

- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of food service equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine roughing-in for piping, mechanical, and electrical systems to verify actual locations of connections before installation.

3.2 INSTALLATION, GENERAL

- A. Install food service equipment level and plumb, according to manufacturer's written instructions, original design, and referenced standards.
- B. Complete equipment field assembly, where required, using methods indicated.
 - 1. Provide closed butt and contact joints that do not require a filler.
 - 2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish. Comply with welding requirements in "Fabrication, General" Article.
- C. Install equipment with access and maintenance clearances according to manufacturer's written instructions and requirements of authorities having jurisdiction.
- D. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.
- E. Except for mobile and adjustable-leg equipment, securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners, unless otherwise indicated.
- F. Install cabinets and similar equipment on concrete or masonry bases in a bed of sealant.
- G. Install hoods to comply with NFPA 96 requirements and to remain free from vibration when operating.
- H. Install seismic restraints according to referenced SMACNA standard.
- I. Install trim strips and similar items requiring fasteners in a bed of sealant. Fasten with

stainless-steel fasteners at 48 inches (1200 mm) o.c. maximum.

- J. Install sealant in joints between equipment and abutting surfaces with continuous joint backing, unless otherwise indicated. Provide airtight, watertight, vermin-proof, sanitary joints.

3.3 PROTECTING

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure food service equipment is without damage or deterioration at the time of Substantial Completion.

3.4 COMMISSIONING

- A. Startup Services: Engage factory-authorized service representatives to perform startup services and to demonstrate and train NAFI's maintenance personnel as specified below.
 1. Coordinate food service equipment startup with service-utility testing, balancing, and adjustments. Do not operate steam lines before they have been cleaned and sanitized.
 2. Remove protective coverings and clean and sanitize equipment, both inside and out, and relamp equipment with integral lighting. Where applicable, comply with manufacturer's written cleaning instructions.
 3. Test each equipment item for proper operation. Repair or replace equipment that is defective in operation, including units that operate below required capacity or that operate with excessive noise or vibration.
 4. Test refrigeration equipment's ability to maintain specified operating temperature under heavy-use conditions. Repair or replace equipment that does not maintain specified operating temperature.
 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 6. Test motors and rotating equipment for proper rotation and lubricate moving parts according to manufacturer's written instructions.
 7. Test water, drain, gas, steam, oil, refrigerant, and liquid-carrying components for leaks. Repair or replace leaking components.
 8. Train NAFI's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance for each food service equipment item.

9. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout."
10. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
11. Schedule training with NAFI, with at least 7 days' advance notice.

3.5 FOOD SERVICE EQUIPMENT SCHEDULE

- A. Products: Subject to compliance with requirements, provide one of the following
 1. See Food Service Equipment Schedule/Specifications on following pages.
 - 2.

ITEMIZED EQUIPMENT SCHEDULE/SPECIFICATIONS

ITEM 1: BACKBAR STORAGE CABINET, NON-REFRIGERATED

Quantity: One (1)

Manufacturer: Perlick Corporation

Model: BN48

Furnish and set in place per manufacturer's standard specifications and the following:

1. Backbar Storage Cabinet, two-section, non-refrigerated.
34.5(h) x 48(w) x 24.75(d)
2. Top: Stainless steel.
3. Lock & Grille Rail Finish, black.
4. Door: Black pre-coated.
5. Left.
6. Door: Black pre-coated.

7. Left.
8. Two (2) ea Chrome, Full Length SS Handle.
9. Stainless steel ends, standard.

ITEM 2: COFFEE BREWER FOR GLASS DECANTERS

Quantity: Two (2)

Manufacturer: Bunn-O-Matic

Model: CWTF15-3-0217

Furnish and set in place per manufacturer's standard specifications and the following:

1. Two (2) ea 12950.0217 CWTF15-3 Coffee Brewer, automatic, with 1 lower and 2 upper warmers, hot water faucet, stainless steel funnel, pourover feature, stainless decor, 120v/15amp.

18.9(h) x 8.5(w) x 17.8(d)

ITEM 3: BOTTLE COOLER

Quantity: One (1)

Manufacturer: Perlick Corporation

Model: BC96

Furnish and set in place per manufacturer's standard specifications and the following:

1. Bottle Cooler, 8 ft., flat top, self-contained refrigeration system, deep well design, 3-sliding doors, 58 case cap., black exterior, s/s interior, top & doors, condensate evaporator, 1/3 HP, 7.6 amps, 115v/60/1-ph. 34(h) x 96(w) x 24(d)

2. 5 Yr. compressor warranty.
3. Cabinet Finish, black.
4. Door Lock Option, door standard without lock.
5. Standard Temp 38°.
6. Dividers.

ITEM 4: BACKBAR CABINET, REFRIGERATED

Quantity: One (1)

Manufacturer: Perlick Corporation

Model: CS60SG

Furnish and set in place per manufacturer's standard specifications and the following:

1. Cooler, 2-section, 34" high, black vinyl clad exterior, glass doors w/locks, stainless steel top, refrigerated, condensing unit on left, galvanized interior, plastic coated shelves, 1/4 hp. 34.5(h) x 60(w) x 24.75(d)
2. 5 Yr. compressor warranty.
3. 115v/60/1-ph, 5.9 amps, NEMA 5-15P, std.

ITEM 5: UNDERBAR ICE BIN COCKTAIL STATION

Quantity: One (1)

Manufacturer: Perlick Corporation

Model: TSD36IC8

Furnish and set in place per manufacturer's standard specifications and the following:

1. TSD Ice Chest, 3 ft., with 8 circuit cold plate, ABS top ledge, modular, 24" deep, 6" splash, approximately 85-lb. ice capacity, galvanized steel back & bottom, stainless steel construction, 1-5/8" s/s legs with 1" adjustable thermoplastic feet.
2. Bottle Rail, 36", factory installed. 36(w)

ITEM 6: UNDERBAR BLENDER STATION

Quantity: One (1)

Manufacturer: Perlick Corporation

Model: TSD12BLW

Furnish and set in place per manufacturer's standard specifications and the following:

1. TSD Blender Station, 12", dump sink (10-5/8" x 9-5/8" x 6") w/deck mounted faucet, recessed blender shelf w/duplex outlet, 29-3/8" front to back w/6" splash, stainless steel construction. 12(w)

ITEM 7: BLENDER, BAR TYPE

Quantity: One (1)

Manufacturer: Vita-Mix

Model: 5004

Furnish and set in place per manufacturer's standard specifications and the following:

1. (VM0100) Drink Machine, 48 oz. (1.4 liter) high-impact, clear container w/ice blades, 2 speed, grey base, 2 peak HP, 120V, 50/60 Hz, 11.5 amps, UL, cUL listed, NSF certified. 17.5(h) x 8(w) x 9(d)

2. 120 volt standard, std.

ITEM 8: GLASS FROSTER

Quantity: One (1)

Manufacturer: Perlick Corporation

Model: FR24

Furnish and set in place per manufacturer's standard specifications and the following:

1. Glass Froster, 2 ft., underbar, self-contained refrigeration system, top opening with sliding door, black vinyl clad exterior, stainless steel interior, top & door, push button defrost, 1/3 HP, 5.8 amps. 24(w)
2. 5 Yr. compressor warranty.
3. 115v/60/1, 5.8 amps, cord & plug, standard.
4. Cabinet Finish, black.
5. Flat Shelving (two layers)

ITEM 9: SPARE NO.

ITEM 10: DRAFT BEER COOLER

Quantity: One (1)

Manufacturer: Perlick Corporation

Model: DS84BLT

Furnish and set in place per manufacturer's standard specifications and the following:

1. Draft Beer Dispenser, self-contained refrigeration system, four-keg capacity (LESS TAPPING EQUIPMENT), stainless steel top, back and ends, black doors and grille, with door locks, 1/3 hp, 7.5 amps, 115v. 34.5(h) x 84(w) x 24.75(d)
2. 5 Yr. compressor warranty.
3. Two (2) ea Draft Arm, 2 Faucet, #63252.
4. Two (2) ea CO2 Shut-Off Valve Kit, for additional set of tapping equipment.

ITEM 11: UNDERBAR HAND SINK UNIT

Quantity: One (1)

Manufacturer: Perlick Corporation

Model: TSD18HST

Furnish and set in place per manufacturer's standard specifications and the following:

1. TSD Underbar Hand Sink, 18", 10" x 14" x 9-1/4" sink, soap & towel dispenser, 24" front-to-back w/6" splash on back & both sides, s/s top, front end and legs, (NSF listed component).

ITEM 12: SPARE NO.

ITEM 13: SPARE NO.

ITEM 14: UNDERBAR SINK

Quantity: One (1)

Manufacturer: Perlick Corporation

Model: TSD53C

Furnish and set in place per manufacturer's standard specifications and the following:

1. TSD Underbar Sink Unit, 60", (3) 10" X 14" sink compartments, deck mounted NSF listed faucet, (2) 12" drainboards, 24" front to back with 6" splash, s/s construction, 1-5/8" s/s legs with 1" adjustable thermoplastic feet.

ITEM 15: WORK TABLE, 24" LONG

Quantity: One (1)

Manufacturer: Eagle Group

Model: UT2424B

Furnish and set in place per manufacturer's standard specifications and the following:

1. Work Table, 24"W x 24"L, 16 gauge type 430 stainless steel top with 1-1/2" upturned back, rolled front edge, square turndown ends, 18 gauge galvanized adjustable undershelf, 1-5/8" O.D. 16 gauge galvanized legs, adjustable high impact plastic bullet feet, Uni-Lok® system, front edge, square turndown ends, 18 gauge galvanized adjustable undershelf, 1-5/8" O.D. 16 gauge galvanized legs, adjustable high impact plastic bullet feet, Uni-Lok® system.

ITEM 16: SPARE NO.

ITEM 17: SPARE NO.

ITEM 18: WORK TABLE, 24" LONG

Quantity: One (1)

Manufacturer: Eagle Group

Model: UT2424B

Furnish and set in place per manufacturer's standard specifications and the following:

1. Work Table, 24"W x 24"L, 16 gauge type 430 stainless steel top with 1-1/2" upturned back, rolled front edge, square turndown ends, 18 gauge galvanized adjustable undershelf, 1-5/8" O.D. 16 gauge galvanized legs, adjustable high impact plastic bullet feet, Uni-Lok® system.

ITEM 19: POPCORN POPPER

Quantity: One (1)

Manufacturer: Star Mfg.

Model: 86SS

Furnish and set in place per manufacturer's standard specifications and the following:

1. Super JetStar™ Popcorn Popper, counter model, 8-oz popper kettle, (170) 1 oz. servings, w/infrared heat lamp, approximately 25" x 19" footprint, clear tempered glass panels, self-service, stainless steel, 30.5(h) x 19.5(w) x

14.25(d)

2. 1 Yr, parts & labor warranty, std.
3. 120v/60/1-ph, 1197 watts, 10.0 amps, cord w/NEMA #5-15P, std.

ITEM 20: SPARE NO.

ITEM 21: SPARE NO.

ITEM 22: SS PASS-THRU

Quantity: One (1)

Manufacturer: Eagle Group

Furnish and set in place per manufacturer's standard specifications and the following:

1. SS pass-thru.

ITEM 23: FOOD WARMER/BAIN MARIE, COUNTERTOP, ELECTRIC

Quantity: One (1)

Manufacturer: Wells

Model: SMPT

Furnish and set in place per manufacturer's standard specifications and the following:

1. Food Warmer, countertop, electric, one 12" x 20" pan opening, wet/dry operation, thermostatic controls, stainless steel construction, with cordset and 4" legs, 1240w/1650w, 14.75(w) x 23.5(d)
2. 120v/60/1-ph, 1650w, 13.75 amps, NEMA 5-15P.
3. Adapter Top, to convert 12" x 20" square corner warmer to hold (2) 7 qt insets.

ITEM 24: SPARE NO.

ITEM 25: SHELF, MICROWAVE

Quantity: One (1)

Manufacturer: Eagle Group

Model: MWS1824

Furnish and set in place per manufacturer's standard specifications and the following:

1. Microwave Shelf, Wall-Mounted, 18 gauge 430 stainless steel, 18"W x 2 feet long, 24(w) x 18(d)

ITEM 26: MICROWAVE OVEN

Quantity: One (1)

Manufacturer: Panasonic

Model: NE-1054

Furnish and set in place per manufacturer's standard specifications and the following:

1. Pro Microwave Oven, 1000 Watts, single shelf, 10 programmable memory pads, double quantity pad, Braille touch-control keypad, 6 power levels, bottom energy feed, stainless steel door, digital display, cavity: 13"Wx13"Dx8-1/16"H, 120v/60/1-ph, 13.4 amps, UL, NSF.
2. 1 year parts & labor warranty.
3. NEMA 5-15P.

ITEM 27: HOT DOG GRILL, ROLLER-TYPE

Quantity: One (1)

Manufacturer: Star Mfg.

Model: 30CBBC

Furnish and set in place per manufacturer's standard specifications and the following:

1. Star Grill-Max® Hot Dog Grill, roller-type, bun holder w/clear door, chrome-plated rollers, capacity 30 hot dogs & 32 buns, 12.5(h) x 23.75(w) x 20.63(d)
2. 1 Yr, parts & labor warranty, std.
3. 120v/60/1-ph, 1150 watts, 10 amps, cord w/NEMA #5-15P, std.

ITEM 28: SHELF, WALL-MOUNTED

Quantity: One (1)

Manufacturer: Eagle Group

Model: SWS1236-16/4

Furnish and set in place per manufacturer's standard specifications and the following:

1. Snap-n-Slide™ Wall Shelf, 12" x 36", 1-1/2" upturn on rear and ends, 1-1/2" roll on front edge, 12" width, 16 gauge type 430 stainless steel, 36(w) x 12(d)

ITEM 29: WORK TABLE, 72" LONG

Quantity: One (1)

Manufacturer: Eagle Group

Model: T3072B-BS

Furnish and set in place per manufacturer's standard specifications and the following:

1. Work Table, 30"W x 72"L, 16 gauge type 430 stainless steel top with 4-1/2" backsplash, rolled front edge, square turndown ends, 18 gauge galvanized adjustable undershelf, 1-5/8" O.D. 16 gauge galvanized legs, adjustable high impact plastic bullet feet, Uni-Lok® system, 72(w) x 30(d)

ITEM 30: WORK TABLE, 60" LONG

Quantity: One (1)

Manufacturer: Eagle Group

Model: T3060B-BS

Furnish and set in place per manufacturer's standard specifications and the following:

1. Work Table, 30"W x 60"L, 16 gauge type 430 stainless steel top with 4-1/2" backsplash, rolled front edge, square turndown ends, 18 gauge galvanized adjustable undershelf, 1-5/8" O.D. 16 gauge galvanized legs, adjustable

high impact plastic bullet feet, Uni-Lok® system, 60(w) x 30(d)

ITEM 31: FREEZER, REACH-IN

Quantity: One (1)

Manufacturer: True Food Service Equipment

Model: T-23F

Furnish and set in place per manufacturer's standard specifications and the following:

1. Freezer, Reach-in, one-section, -10° F, 23 cu. ft., (3) shelves, stainless steel front & exterior, aluminum ends, white aluminum interior with stainless steel floor, (1) s/s hinged door with lock, dial thermometer, 4" castors, 1/3HP, 115v/60/1-ph, NEMA 5-15P, 7.2 amps, Energy Star rated, MADE IN USA, 78.38(h) x 27(w) x 29.5(d)
2. Self-contained refrigeration standard.
3. 4" Swivel castors, standard (adds 5" to OA height)
4. Warranty - 5 year compressor (self-contained only), applicable to US and Canada.
5. Warranty - 1 year parts and labor, applicable to US and Canada.
6. Door hinged right standard.

ITEM 32: VENTAHOOD W/ FIRE SUPPRESSION SYSTEM

Quantity: One (1)

Manufacturer: Captive-Aire

Furnish and set in place per manufacturer's standard specifications and the following:

1. Ventahood w/ fire suppression system.

ITEM 33: FRYER, FLOOR MODEL, GAS, FULL POT

Quantity: Two (2)

Manufacturer: Dean Industries

Model: SM40G

Furnish and set in place per manufacturer's standard specifications and the following:

1. Two (2) ea Super Marathon™ Fryer, Gas, heavy-duty floor model, 35-43 pound capacity, 14"x14" fry area, millivolt pilot system with mechanical thermostat, s/s frypot, front and door, enamel sides, 6" adjustable steel legs, CE, NSF, 105,000 BTU.
2. Two (2) ea Gas type to be specified.

ITEM 34: SPARE NO.

ITEM 35: FRYER BATTERY, GAS

Quantity: One (1)

Manufacturer: Dean Industries

Model: SM40G-UFF(2)

Furnish and set in place per manufacturer's standard specifications and the following:

1. Under Fryer Filter-Pre Packaged System, Gas, (2) Super Marathon Fryers,

35-43 pound fat capacity, millivolt pilot system, manual thermostat, s/s pot & door, painted sides, with filter starter kit, casters, 210,000 BTU.

2. Natural gas.
3. 120v/60/1-ph, 6.2 amp, 5 gallons per minute filter pump, std.
4. Fryer Drain Cabinet, fryer match design, free-standing design with s/s flat top, 15-1/2" overall width, baked enamel exterior, stainless steel door, UL, NSF, CSA, 15.5(w) x 29.5(d)
5. NOTE: Must specify location of cabinet in fryer line-up.
6. 120v/60/1, 6.9amps, standard.
7. Cabinet located on right.
8. Cabinet top: Dump station w/food warmer.
9. 6" Casters, std.
10. Left side, 1-1/4" Rear gas manifold w/out shut-off valve, std.

ITEM 36: SPARE NO.

ITEM 37: CHARBROILER, GAS, COUNTER MODEL

Quantity: One (1)

Manufacturer: Garland/US Range

Model: RG-HDSA-36

Furnish and set in place per manufacturer's standard specifications and the following:

1. Regal Charbroiler, 36"W, gas, heavy duty removable cast iron radiants, three position, adjustable grate, built-in front grease trough, large capacity, removable drip pan & grease can, s/s front and sides, 108,000 BTU, CSA, NSF (U S Range)
2. One year limited parts and labor warranty, covers products purchased and installed in the USA only, standard.
3. Gas type to be specified.

ITEM 38: REFRIGERATED COUNTER, GRIDDLE STAND

Quantity: One (1)

Manufacturer: True Food Service Equipment

Model: TRCB-36

Furnish and set in place per manufacturer's standard specifications and the following:

1. Refrigerated Chef Base, 36-3/8"L, one-piece 300 series 18 gauge s/s top with V edge, s/s front/sides, aluminum back, white aluminum interior with 300 s/s floor, (2) drawers [accommodates (1) 12"x20"x4" pans and (3) 1/6 size pans, NOT included], 4" castors, 1/5hp, 115v/60/1-ph, NEMA 5-15P, 5.7 amps, MADE IN USA, 20.38(h) x 36.38(w) x 32.13(d) front/sides, aluminum back, white aluminum interior with 300 s/s floor, (2) drawers [accommodates (1) 12"x20"x4" pans and (3) 1/6 size pans, NOT included], 4" castors, 1/5hp, 115v/60/1-ph, NEMA 5-15P, 5.7 amps, MADE IN USA, 20.38(h) x 36.38(w) x 32.13(d)
2. Self-contained refrigeration standard.
3. Warranty - 5 year compressor (self-contained only), applicable to US and Canada.
4. Warranty - 1 year parts and labor, applicable to US and Canada.
5. 4" Castors, standard.

ITEM 39: SPARE NO.

ITEM 40: RANGE, GAS, HEAVY-DUTY, 34"

Quantity: One (1)

Manufacturer: Garland/US Range

Model: M44R

Furnish and set in place per manufacturer's standard specifications and the following:

1. Master Series Heavy Duty Range, 34"W, gas, (4)35,000 BTU open burners, standard oven w/Piezo ignition, 1-1/4" front manifold, s/s front, black sides, (s/s exposed sides on batteries), 6" legs, 180,000 BTU (Garland) 34(w) x 37.88(d)
2. One year limited parts and labor warranty, covers products purchased and installed in the USA only, standard.
3. Natural gas, specify elevation if over 2,000 ft.
4. 1" Rear gas connection, including "Tee" in manifold, end cap & cover (Consult spec sheet and specify)
5. Single Convection Oven, 1/3 hp, add suffix -C to Model No.
6. (Convection oven) 120V/60/1-ph, 3.4 amps, NEMA 5-15P.
7. Extra Oven Rack, for convection 26-1/2" full size ovens.
8. Swivel Casters, set of four (4) 2 locking, 2 non-locking.
9. NOTE: Oven base ranges require either Highshelf or backguard.
10. Master Series Single High Shelf, 22-1/2" H, 34" W, s/s tubular shelf, front and sides (Garland) 34(w)

ITEM 41: SPARE NO.

ITEM 42: SPARE NO.

ITEM 43: SPARE NO.

ITEM 44: SPARE NO.

ITEM 45: SPARE NO.

ITEM 46: REFRIGERATOR, REACH-IN

Quantity: One (1)

Manufacturer: True Food Service Equipment

Model: TG1R-1S

Furnish and set in place per manufacturer's standard specifications and the following:

1. Refrigerator, Reach-in, one-section, 31 cu. ft., (3) vinyl coated shelves, s/s door and rainshield, aluminum ends, white aluminum interior with s/s floor, 34-5/8"D, (1) hinged s/s door with lock, exterior digital temperature display, 4" swivel castors, 1/3 HP, 115v/60/1-ph, MADE IN USA, 78.25(h) x 29(w) x 34.63(d)
2. Self-contained refrigeration standard.
3. 4" Castors, standard.
4. Warranty - 5 year compressor (self-contained only), please visit www.truemfg.com for specifics.
5. Warranty - 1 year parts and labor, please visit www.truemfg.com for specifics.
6. Left door hinging.

ITEM 47: SPARE NO.

ITEM 48: SPARE NO.

ITEM 49: SPARE NO.

ITEM 50: WORK TABLE, 72" LONG

Quantity: One (1)

Manufacturer: Eagle Group

Model: T3072B-BS

Furnish and set in place per manufacturer's standard specifications and the following:

1. Work Table, 30"W x 72"L, 16 gauge type 430 stainless steel top with 4-1/2" backsplash, rolled front edge, square turndown ends, 18 gauge galvanized adjustable undershelf, 1-5/8" O.D. 16 gauge galvanized legs, adjustable high impact plastic bullet feet, Uni-Lok® system.

ITEM 51: REFRIGERATED COUNTER, WORK TOP

Quantity: One (1)

Manufacturer: True Food Service Equipment

Model: TWT-67

Furnish and set in place per manufacturer's standard specifications and the following:

1. Deep Work Top Refrigerator, two-section, 20.6 cu.ft., (4) shelves, s/s top with rear splash, (2) door & sides, white aluminum interior with 300 series s/s floor, 5" castors, side mount front breather, 1/5 HP, 115v/60/1-ph, 5.1 amps, NEMA 5-15P, Energy Star rated, MADE IN USA, 33.38(h) x 67.25(w) x 32.38(d) door & sides, white aluminum interior with 300 series s/s floor, 5" castors, side mount front breather, 1/5 HP, 115v/60/1-ph, 5.1 amps, NEMA 5-15P, Energy Star rated, MADE IN USA, 33.38(h) x 67.25(w) x 32.38(d)
2. Self-contained refrigeration standard.
3. Warranty - 5 year compressor (self-contained only), please visit www.truemfg.com for specifics.
4. Warranty - 1 year parts and labor, please visit www.truemfg.com for specifics.
5. Alternative hinging available, please contact factory.

6. 5" Castors, standard.

ITEM 52: SPARE NO.

ITEM 53: FREEZER, REACH-IN

Quantity: One (1)

Manufacturer: True Food Service Equipment

Model: T-23F

Furnish and set in place per manufacturer's standard specifications and the following:

1. Freezer, Reach-in, one-section, -10° F, 23 cu. ft., (3) shelves, stainless steel front & exterior, aluminum ends, white aluminum interior with stainless steel floor, (1) s/s hinged door with lock, dial thermometer, 4" castors, 1/3HP, 115v/60/1-ph, NEMA 5-15P, 7.2 amps, Energy Star rated, MADE IN USA, 78.38(h) x 27(w) x 29.5(d)
2. Self-contained refrigeration standard.
3. 4" Swivel castors, standard (adds 5" to OA height)
4. Warranty - 5 year compressor (self-contained only), applicable to US and Canada.
5. Warranty - 1 year parts and labor, applicable to US and Canada.
6. Door hinged right standard.

ITEM 54: REFRIGERATED COUNTER, SANDWICH TOP

Quantity: One (1)

Manufacturer: True Food Service Equipment

Model: TSSU-48-12

Furnish and set in place per manufacturer's standard specifications and the following:

1. Sandwich/Salad Unit, 12 cu.ft., (12) 1/6 size (4"D) poly pans, s/s insul. cover, 11-3/4"D cutting board, s/s top/front/sides, aluminum back, (2) doors, (4) shelves, white aluminum interior with 300 ss floor, 5" castors, 1/3Hp, 115v/60/1-ph, NEMA 5-15P, 8.6 amps, NSF-7, MADE IN USA, 36.75(h) x 48.38(w) x 30.13(d)
2. Self-contained refrigeration standard.
3. Warranty - 5 year compressor (self-contained only), applicable to US and Canada.
4. Warranty - 1 year parts and labor, applicable to US and Canada.
5. Alternative hinging available, please contact factory.
6. 5" Castors, standard.

ITEM 55: WORK TABLE

Quantity: One (1)

Manufacturer: Eagle Group

Model: OB3048SE

Furnish and set in place per manufacturer's standard specifications and the following:

1. Spec-Master® Enclosed Work Table, 30"W x 48"L, open front, 14 gauge type 304 stainless steel top with rolled edges front & back, square turndown ends, 18 gauge type 430 s/s wrapper, s/s legs, adjustable feet, 48(w) x 30(d)

ITEM 56: TOASTER, POP-UP

Quantity: One (1)

Manufacturer: Hobart

Model: ET27-5

Furnish and set in place per manufacturer's standard specifications and the following:

1. Toaster, Pop-Up, 4-slice bread toaster, 1" wide slots, approximately 290 slices/hour cap, solid-state temperature sensor & probes, removable crumb tray, s/s exterior, 208v/60/1 VAC 2-Pole/3-wire w/cordset, 2.8 kw.

ITEM 57: SINK, TWO (2) COMPARTMENT

Quantity: One (1)

Manufacturer: Eagle Group

Model: FN2032-2-18-14/3

Furnish and set in place per manufacturer's standard specifications and the following:

1. Spec-Master® Sink, Two Compartment, s/s, w/18" left & right-hand drain-boards, 20" front-to-back x 16"W compartment, 14"D, with 9-1/2"H splash, s/s open frame base, boxed crossrails, 14/304 s/s, 37.5(h) x 72(w) x 27(d)
2. T&S Faucet, splash-mounted, 8" centers, 10" swing nozzle, extra heavy-duty.

ITEM 58: SINK, HAND

Quantity: One (1)

Manufacturer: Eagle Group

Model: HSAP-14-FW

Furnish and set in place per manufacturer's standard specifications and the following:

1. Hand Sink, wall model, 24-1/8" x 19" x 16-1/2", stainless steel construction, with deck mounted gooseneck faucet with wrist handles, Wall brackets, basket drain, PHYSICALLY CHALLENGED.

ITEM 59: REFRIGERATED COUNTER, WORK TOP

Quantity: One (1)

Manufacturer: True Food Service Equipment

Model: TWT-60

Furnish and set in place per manufacturer's standard specifications and the following:

1. Work Top Refrigerator, two-section, 15.5 cu.ft., (4) shelves, s/s top with rear splash, (2) door & sides, white aluminum interior with 300 series s/s floor, 5" castors, rear mount, 1/5 HP, 115v/60/1-ph, 5.1 amps, NEMA 5-15P, Energy Star rated, MADE IN USA, 33.38(h) x 60.38(w) x 30.13(d)
2. Self-contained refrigeration standard.
3. Warranty - 5 year compressor (self-contained only), applicable to US and Canada.
4. Warranty - 1 year parts and labor, applicable to US and Canada.
5. Alternative hinging available, please contact factory.
6. 5" Castors, standard.

ITEM 60: SPARE NO.

ITEM 61: SHELF, WALL-MOUNTED

Quantity: Three (3)

Manufacturer: Eagle Group

Model: SWS1248-16/4

Furnish and set in place per manufacturer's standard specifications and the following:

1. Three (3) ea Snap-n-Slide™ Wall Shelf, 12" x 48", 1-1/2" upturn on rear and ends, 1-1/2" roll on front edge, 12" width, 16 gauge type 430 stainless steel, 48(w) x 12(d)

ITEM 62: SPARE NO.

ITEM 63: SPARE NO.

ITEM 64: ICE MAKER, CUBE-STYLE

Quantity: One (1)

Manufacturer: Ice-O-Matic

Model: ICE0606HA

Furnish and set in place per manufacturer's standard specifications and the following:

1. ICE Series™ Modular Cube Ice Maker, air-cooled, approximately 652 lb production/24 hours, half-size cube, filter-free air, PURE ICE built in antimicrobial protection, Harvest assist produces Ice consistently/reduces operating cost, 208-230v/60/1-ph, 11.5 amps, 20(h) x 30(w) x 24(d)
2. 3 yr. parts & labor warranty on all components, std.
3. 5 yr. evaporator warranty, std.
4. 5 yr. compressor warranty, std.
5. Ice Bin, 854 lb storage capacity, w/top-hinged front-opening door, for top-mounted ice maker, stainless steel exterior, molded plastic door, 50(h) x 48(w) x 31(d)
6. Bin Top, for 30" ICE series cuber on 48" bin (must be purchased with bin) 48(w)
7. Water Filter Manifold designed for ice makers producing up to 1,000 lbs. (454.4 Kg.) of ice per day, 1.5 gallons per minute maximum flow rate, IsoNet scale inhibitor, .5 micron particle reduction, 6 month replacement, 15(h) x 6(w) x 4(d)
8. 7 yr Evaporator warranty in lieu of std. 5 yr, if a water filter is purchased with the machine & filters replaced every 6 mo. (USA & Canada only)

ITEM 64.1: ICE AND SODA DISPENSER

Quantity: One (1)

Manufacturer: Custom

Model: 4500 SERIES

Furnish and set in place per manufacturer's standard specifications and the following:

1. To be provided by the Coke or Pepsi Vendor. Provide Lancer 4500 series or

equal with all accessories for a complete system. Coordinate with Food Service Equipment Contractor ice maker.

ITEM 64.2: SYRUP SYSTEM

Quantity: One (1)

Manufacturer: Custom

Model: SODA SYSTEM

Furnish and set in place per manufacturer's standard specifications and the following:

1. Syrup Vendor Supplied, Coke or Pepsi, provide syrup system, co2, soda lines and all accessories for a complete system. Coordinate with Kitchen Equipment contractor.

ITEM 65: SHELVING UNIT, WIRE

Quantity: Two (2)

Manufacturer: Eagle Group

Model: 2460E74

Furnish and set in place per manufacturer's standard specifications and the following:

1. Two (2) ea EAGLEgard® Wire Shelving Unit, (4) 24"W x 60"L shelves, (4) 74" two-piece posts, green epoxy finish w/MICROGARD™ antimicrobial protection, (in one box)

ITEM 66: SPARE NO.

ITEM 67: CAN STORAGE RACK

Quantity: One (1)

Manufacturer: Win-Holt Equipment Group

Model: CR-162

Furnish and set in place per manufacturer's standard specifications and the following:

1. Rack, Can Storage, stationary design, self feeding gravity fed shelves, holds (162) #10 cans or (216) #5 cans, 1-1/2" welded aluminum tubing, 25 1/4"W, 35"D, 71"H, NSF. 71(h) x 25.25(w) x 35(d)

ITEM 68: SPARE NO.

ITEM 69: SHORTENING DISPOSAL UNIT

Quantity: One (1)

Manufacturer: Frymaster

Model: PSDU50

Furnish and set in place per manufacturer's standard specifications and the following:

1. Disposal Unit, Shortening, 50 lb. capacity, manual pump, 9-5/8" drain height, 7" wheels. 48(h) x 15.38(w)
2. One year parts warranty, std.

ITEM 70: UTILITY CART

Quantity: One (1)

Manufacturer: Lakeside Manufacturing

Model: 557

Furnish and set in place per manufacturer's standard specifications and the following:

1. Utility Cart, open design, heavy duty, two 2-1/2" deep shelves, shelf size approximately 21" x 49", push handle & leg bumpers, stainless steel construction, 700 lb. capacity, (2) 5" swivel & (2) 8" fixed casters, NSF. 37.25(h) x 54(w) x 23.25(d)

ITEM 71: BEVERAGE COUNTER

Quantity: One (1)

Manufacturer: Custom

Furnish and set in place per manufacturer's standard specifications and the following:

1. Size and shape per plan. Top to be 3 cm. quartz with 4" high splash at walls, base to be stainless steel construction with bottom and intermediate shelving, provide plumbing access chase for water, drain and soda lines, front to have hinged doors with decorative plastic laminated panels. Base to have 6" high stainless steel legs and adjustable feet with removable stainless steel kick plate attached to the legs. Colors and material finishes to be verified with Architect/Designer.

ITEM 72: TEA BREWER

Quantity: One (1)

Manufacturer: Bunn-O-Matic

Model: TU5Q-0000

Furnish and set in place per manufacturer's standard specifications and the following:

1. 24400.0000 TU5Q Automatic Iced Tea Brewer, 3 or 5-gallon capacity, 1800 watt tank heater, quickbrew system (dispenser sold separately), 120v/60/1-ph, 1800w, 15amps, NEMA 5-15P. 38.5(h) x 10.38(w) x 21(d)

ITEM 73: COFFEE BREWER FOR GLASS DECANTERS

Quantity: One (1)

Manufacturer: Bunn-O-Matic

Model: CWTF-2/2-0001

Furnish and set in place per manufacturer's standard specifications and the following:

1. 23400.0001 CWTF 2/2 TWIN Coffee Brewer, automatic, with 2 lower and 2 upper warmers, (2) 3000 watt tank heaters, brews total 15 gallons per hour capacity, hot water faucet, pourover feature on both sides, two brew heads, stainless steel funnels, stainless decor, 120/240v/60/1-ph, 6650w, 27.7 mps, UL, NSF. 19.1(h) x 16.5(w) x 19.8(d)
2. 06100.0102 Easy Pour® Coffee Decanter, black, 2-pack.
3. 06101.0102 Easy Pour® Coffee Decanter, orange, 2-pack.
4. 20115.0000 Paper Filters-REGULAR-C,S,R,O, VLPF,VPR,VPS,VP-17; Overall Measure x Base Diameter: 9 3/4" x 4 1/4", 1000/case, price based on 1-229 lbs total weight - call for price on greater quantities.

ITEM 74: CONDIMENT CADDY, COUNTERTOP ORGANIZER

Quantity: One (1)

Manufacturer: San Jamar - Chef Revival

Model: L1150

Furnish and set in place per manufacturer's standard specifications and the following:

1. Gourmet® Countertop Organizer, (4) bins for lids/silverware/condiment packets, 18-1/2"D x 8-7/8"W x 3-1/4"H, ABS plastic tray, 22 gauge, 304 stainless.

ITEM 75: PAPER CUP DISPENSER

Quantity: One (1)

Manufacturer: San Jamar - Chef Revival

Model: C2704

Furnish and set in place per manufacturer's standard specifications and the following:

1. Gourmet® Euro EZ-Fit® Box System, contains (4) EZ-Fit Euro cup dispensers mounted into a 22 gauge 304 stainless steel box, 30-1/4"H X 8-1/8"W X 24-5/8"D.

ITEM 76: SPARE NO.

ITEM 77: SPARE NO.

ITEM 78: SPARE NO.

ITEM 79: SPARE NO.

ITEM 80: SHELVING UNIT, WIRE

Quantity: Four (4)

Manufacturer: Eagle Group

Model: 2448E74

Furnish and set in place per manufacturer's standard specifications and the following:

1. Four (4) ea EAGLEgard® Wire Shelving Unit, (4) 24"W x 48"L shelves, (4) 74" two-piece posts, green epoxy finish w/MICROGARD™ antimicrobial protection, (in one box) 74(h) x 48(w) x 24(d)

ITEM 81: DUNNAGE RACK, CHANNEL

Quantity: Two (2)

Manufacturer: Eagle Group

Model: 4004

Furnish and set in place per manufacturer's standard specifications and the following:

1. Two (2) ea Lifetime Series Dunnage Rack, 20" x 36" x 12"H, heavy duty, fully welded aluminum construction, 5000 lb. capacity. 12(h) x 36(w) x 20(d)

ITEM 82-87: SPARE NO.

ITEM 88: WALKIN COOLER/FREEZER COMP W/ REFRIGERATION

Quantity: One (1)

Manufacturer: Tyler Refrigeration

Furnish and set in place per manufacturer's standard specifications and the following:

1. Walkin cooler/freezer comp w/ refrigeration.

ITEM 89: SPARE NO.

ITEM 90: POT SCRUBBER

Quantity: One (1)

Manufacturer: Hobart

Model: TWII+BUILDUP

Furnish and set in place per manufacturer's standard specifications and the following:

1. Turbo Wash ,(8) 1-1/2" angled s/s wash nozzles, heavy duty 2-HP pump motor, on/off pump switch, thermal overload & low water cut-off, 14 gauge. 304 s/s construction.

2. 1-Year parts, labor & travel time during normal working hours.
3. 208-240/60/3.
4. Left-to-right.
5. Hobart labels.
6. W/o auto fill.
7. Mixing faucet - 3/4" heavy duty (two faucets required for units with rinse sinks over 20")
8. Pre-rinse spray - 1/2" high quality swivel style.
9. W/o drain/overflow.
10. 2.5 kw electri heater with two heat settings.
11. *welded at factory.
12. 36" scrapper table without disposer with drain.
13. 30" soiled end drainboard.
14. W/o disposer piping.
15. W/o hobart disposer.
16. Standard hobart controls.
17. W/o drain/overflow.
18. Hemmed edge.
19. With table.
20. 30" wash sink.
21. W/o separator.
22. Three drain without overflows (for wash, rinse and sanitizer sinks)

- 23. W/o wash sink sump.
- 24. 20" rinse sink.
- 25. 20" sanitizer sink.
- 26. 24" clean end drainboard.
- 27. Hemmed edge.
- 28. W/o undershelf.
- 29. W/o 4 hour adjustable timer.
- 30. W/o utensil basket.
- 31. W/o sheet rack.
- 32. W/o overshelf.
- 33. Utensil basket.

ITEM 91: SPARE NO.

ITEM 92: POT RACK, WALL-MOUNTED

Quantity: One (1)

Manufacturer: Eagle Group

Model: WM84PR

Furnish and set in place per manufacturer's standard specifications and the following:

- 1. Pot Rack, Wall-Mounted, double bar design, 84"L, with stainless steel

double hooks, constructed of 3/16" x 2" stainless steel, NSF. 84(w)

ITEM 93-94: SPARE NO.

ITEM 95: TRASH CONTAINER

Quantity: One (1)

Manufacturer: Rubbermaid

Model: FG354000GRAY

Furnish and set in place per manufacturer's standard specifications and the following:

1. Slim Jim® Waste Container, 23 gallon, 20"L x 11"W x 30"H, general purpose waste, open type without lid, high-impact plastic construction, gray. 30(h) x 20(w) x 11(d)

ITEM 96-98: SPARE NO.

ITEM 99: MOP SINK

Quantity: One (1)

Manufacturer: Eagle Group

Model: F1916

Furnish and set in place per manufacturer's standard specifications and the following:

1. Mop Sink, floor mounted, 24-5/8"W x 21-1/2"L, 8"H water level, 2" drain, stainless steel construction. 8(h) x 24.63(w) x 21.5(d)

END OF SECTION 11400

DIVISION 15 -MECHANICAL

15000	MECHANICAL – GENERAL
15052	BURIED PIPING INSTALLATION
15064	REINFORCED CONCRETE PIPE
15100	BASIC PIPING
15120	VALVES
15210A	VIBRATION ISOLATION
15220	MECHANICAL SUPPORTING SYSTEMS
15230	MECHANICAL IDENTIFICATION
15250	MECHANICAL SYSTEMS INSULATION
15270C	HVAC TESTING, BALANCING, AND ADJUSTING
15310	NATURAL GAS
15410	DOMESTIC WATER
15420	SOIL AND WASTE
15450	PLUMBING FIXTURES
15530	HVAC CONTROLS
15600	HVAC EQUIPMENT
15800	HVAC SHEET METAL
15900	FIRE PROTECTION – GENERAL
15910	SPRINKLER SYSTEMS
15940	UNDERGROUND FIRE PROTECTION SYSTEM
15950	HYDRAULIC CALCULATIONS

SECTION 15000 MECHANICAL - GENERAL

PART 1 – GENERAL

1.01 CONTRACT DOCUMENTS

- A. Refer to and comply with all provisions of the General Conditions, Supplementary Conditions, Division 1, General Requirements, Information for Bidders, and other technical sections of these Specifications in the installation of all mechanical work, as they may apply. Mechanical work includes HVAC, plumbing, and fire protection
- B. Drawings are diagrammatic, due to scale, therefore, all offsets, fittings, valves and accessories are not shown. Plan work around building details and other crafts. Furnish coordination drawings as necessary for the installation.
- C. In case of interference between trades, NAFI will decide which work is to take precedence regardless of work that might be installed.

1.02 CODES, ORDINANCES, INSPECTIONS, PERMITS AND STANDARDS

- A. Work is to be executed and inspected in accordance with local and state codes, laws, ordinances, rules and regulations applicable to particular class of work, and any fees in connection therewith are to be paid by Contractor.
- B. Should any part of Drawings or Specifications be found to be in conflict with applicable codes or ordinances, notify the NAFI, in writing, 72 hours prior to receiving of bids. After the receiving of bids, any discovery of code violations shall be promptly reported to the NAFI. Any work performed knowingly in violation of codes shall be corrected without additional expense to the NAFI.
- C. Arrange with Public Works Department regarding work for complete inspection, paying all charges pertaining thereto. Give proper authority all requisite notice relating to work under such; afford NAFI and all responsible parties proper notice for all violations of law. Upon completion of work, have work inspected, if required, obtaining certificate of inspection and approval from inspecting agency and deliver such certificate to NAFI.
- D. Wherever applicable, work shall conform to the latest standards of OSHA, NFPA, UL, ASTM, ANSI, AGA, ASME, ASHRAE, SMACNA and ADA.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submit within 30 days after Notice to Proceed, manufacturer's catalog sheets and/or shop drawings covering all phases of work included in this contract.
- B. Submittals shall be complete, arranged in sets, indexed and bound in folders. No loose sheets or partial submittals will be acceptable.

- C. All submittals shall bear written certification to the effect that the Contractor has examined them and found them to be in accordance with specifications and to be dimensionally correct with reference to available space and to related trades.
- D. Submittals are required even though equipment being furnished is exactly as specified.

1.04 COORDINATION DRAWINGS

- A. The HVAC Contractor shall prepare and submit for approval coordination drawings for mechanical rooms and other high interference areas when requested. The drawings shall include fire protection, plumbing, electrical and other divisions of work as necessary to achieve coordination between the various divisions of work. See Section 15800 for other requirements.
- B. The HVAC Contractor shall obtain the necessary information from the other divisions of work as necessary to coordinate these trades with the HVAC.
- C. The coordination drawings shall be drawn to minimum of quarter inch per foot scale, and shall show plan views, elevations and sections as needed to coordinate the work. Equipment room drawings shall be minimum one-half inch per foot scale.
- D. The coordination drawings shall be submitted to the other divisions of work for approval prior to submission to the NAFI. Furnish six (6) sets for review by the NAFI.
- E. Coordination drawings shall also be furnished to show approved deviations from the construction documents when requested.

1.05 SUBSTITUTION OF MATERIALS

- A. Final decision as to whether or not a specific piece of equipment meets specifications shall rest with NAFI.
- B. Any proposed substitutions of equipment shall be accompanied by Shop Drawings showing revised equipment layouts, piping diagrams, and structural modifications. Where substituted equipment furnished requires use of larger, more, or differently arranged connections, such connections shall be installed to the complete satisfaction of NAFI, without additional cost to NAFI.
- C. Should a substitution be accepted and subsequently proven unsatisfactory for the service intended within the warranty period, the contractor shall replace this material or equipment with that as originally specified, or corrected as directed by NAFI, at no additional cost to the NAFI.

1.06 LOCAL SITE CONDITIONS

- A. Before bidding, make complete investigation at Site in order to be informed as to location of utilities and as to conditions under which work is to be performed. Locations of existing above ground and underground utilities and structures

shown were obtained from surveys and/or as built drawings and are not to be assumed as being accurate.

- B. Make determination of soil conditions before bidding. These specifications and accompanying drawings in no way imply as to condition of soil to be encountered.

1.07 GUARANTY-WARRANTY

- A. All materials and equipment shall carry a full year's warranty from time NAFI accepts building or the date of substantial completion, whichever is earlier, regardless of start-up date of equipment, unless a longer warranty period is specified under other sections.
- B. The HVAC equipment installation shall be completed in a timely manner, such that the system can be operated to "dry out" the building to permit application of the final building finishes during the construction. Additional air filters shall be furnished as needed during the construction phase.

1.08 RECORD SET DRAWINGS

- A. Refer to Section H-16.

1.09 NAFIS OPERATING AND MAINTENANCE MANUALS

- A. Refer to Section H-22.

1.10 CLEAN UP

- A. Do not allow waste material or rubbish to accumulate in or about job site.
- B. At completion of work, remove all rubbish, tools, scaffolding and surplus materials from and about building, leaving work clean and ready for use without further cleaning required. Clean all equipment, piping, valves, fixtures, and fittings of grease, metal cuttings, insulation cement, dust, dirt, paper labels, etc.
- C. Any discoloration or other damage to buildings, their finishes or furnishings due to failure to properly clean or keep clean mechanical systems shall be repaired without cost to NAFI.

1.11 CUTTING AND PATCHING

- A. Provide all cutting and patching required to perform the Mechanical work.
- B. All patching will be done by workmen skilled in the trade required.

1.12 EXCAVATION, TRENCHING, AND BACKFILLING

- A. All excavation, trenching and backfilling in connection with the Mechanical System is included as part of this Division.

- B. All excavation required shall be done as part of the Bid Price regardless of any implied conditions on the Plans or in these Specifications.
- C. Do not carry excavation below required level unless indicated otherwise on the Drawings. Excess excavation below required level shall be backfilled at no expense to NAFI with earth, sand, gravel or concrete, as directed by NAFI and thoroughly compacted. Remove any unstable soil and replace with clean sand or soil and thoroughly compact. NAFI will determine the depth of removal of any unstable soil encountered. Grade ground adjacent to excavations to prevent water running in. Remove by pumping or other means any water accumulated in excavation.
- D. Banks of trenches shall be vertical or as shown on the Drawings. Width of trench to be 5" minimum, 8" maximum on each side of pipe bell. Bottom of trench for sewers and culverts shall be rounded so that an arc of circumference equal to 0.6 of outside diameter or pipe rests on undisturbed soil wherever practicable. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried 8" below bottom of pipe. Use loose earth or gravel for backfill and tamp thoroughly.
- E. Bracing, sheathing and shoring shall be performed as necessary to complete and protect excavations as required for safety and to conform to governing laws.
- F. After piping, conduit, ducts, etc. have been installed, inspected, tested and approved by governing agency, backfill trenches with clean, stable soil free from stones. Place backfill in 4" layers, tamped under and around pipe and conduit to height of at least 2'-0" above pipe. Tamping shall be done in such manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in 8" layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand.
- G. Replace existing appurtenances removed or damaged in connection with work, and restore to original conditions, unless otherwise directed.

PART 2 - PRODUCTS
NOT USED

PART 3 - EXECUTION
NOT USED

END OF SECTION 15000

SECTION 15052 – BURIED PIPE INSTALLATION**PART 1 — GENERAL****1.01 DESCRIPTION**

- A. Scope:
 - 1. The Contractor shall furnish all labor, materials, equipment, and incidentals as shown, specified, and required to install all buried piping, fittings, and specials.
 - 2. The Work includes, but is not limited to, the following:
 - a. All types of buried piping unless specifically included under other Sections
 - b. Pipe beneath structures
 - c. Testing, cleaning, and disinfecting
 - d. Installation of all jointing and gasketing materials, specials, couplings, and all other Work required to complete the piping installation
 - e. All appurtenances and specials shown, specified or required shall be incorporated into the piping systems. Valves, specials and appurtenances shall be as specified in other Division 15 Sections.
- B. Coordination: Review installation procedures under other Sections and coordinate with the Work that is related to this Section.

1.02 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
 - 1. Size, class and other details of pipe to be used
 - 2. Information on typical joint and harnessing details
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Submit copies of all test reports.
- C. Record Drawings: During progress of the Work, keep an up to date set of drawings showing field modifications. Submit drawings at a scale satisfactory to the NAFI that show the actual in-place installation of all piping and appurtenances installed under this Section. The drawings shall show all piping on plans with all reference dimensions and elevations required for complete record drawings of the piping systems. The drawings shall be furnished not later than 30 days after Substantial Completion of the Work.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery, storage and handling of pipe, fittings, and specials shall be in complete compliance with the manufacturer's instructions.
- B. Handle all pipe, fittings, and accessories carefully with approved handling devices. Do not drop or roll pipe off trucks. Do not otherwise drop, roll or skid pipe. Materials cracked, gouged, chipped, dented, or otherwise damaged will not be approved.

- C. Pipe, fittings, and specials shall be unloaded opposite to or as close to the place where they are to be laid as is practicable to avoid unnecessary handling. Interiors shall be kept free from dirt and foreign matter.

PART 2 — PRODUCTS

2.01 MATERIALS

- A. Pipe materials are specified under each applicable pipe material sections of Division 15.
- B. Pipe Backfill: See Section 02220, Excavation & Backfill.
- C. Pipe Marking:
 - 1. General:
 - a. Each piece of pipe or fitting shall be clearly marked with a designation which shall conform with designations shown on the Shop Drawings.
 - b. Class designation shall be cast or painted on each piece of pipe or fitting 4" in diameter and larger.
 - c. Piping, smaller than 4" diameter shall be clearly marked by manufacturer as to material, type and rating.
 - 2. Magnetic Underground Warning Tape (Pressure Pipe Only):
 - a. The CONTRACTOR shall place magnetic warning tape approximately 12"–18" below grade in all flexible pressure pipe trenches.
 - b. Buried pressure sewer piping warning tape:
Message: "CAUTION - BURIED PRESSURE SEWER or WATER LINE"
 - c. Size and Color: 3" wide and green (Sewer) or blue (Water) background with black lettering.
 - 3. Tracer Wire: (Pressure Pipe Only)
 - a. The contractor shall place tracer wire above all pressure pipe in pipe trench 6" above pipe. Tracer wire shall be accessible to NAFI at all valve boxes, water meter boxes, and Line Markers.
 - b. Tracer wire shall be rated for direct bury with polyvinyl chloride insulation of 60 mils. Insulation shall meet APWA Color Code for identification of buried utilities.
 - c. Wire shall be 12 AWG solid copper meeting UL Standard 493, Fed. Spec A-A-56544, and National Electric Code Standards.
 - 4. Line Marker 3 1/2" Diameter 6 ft. tall polymeric marker for all pressure mains 3" diameter and larger. Markers are required every 1,000 ft. and at all bends and valves in unpaved areas. Line markers text shall be solvent based ink and UV resistant. Marker graphics shall be blue for potable water and green for wastewater with black lettering. Markers shall have a reflector, visible 360° at the top of each marker. Marker shall state NAFI's name and contact information.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Install piping as shown, specified and as recommended by the manufacturer.
2. Request instructions from the NAFI before proceeding if there is a conflict between the manufacturer's recommendations and the Drawings or Specifications.
3. Pipe, fittings and accessories that are cracked, damaged or in poor condition or with damaged linings will be rejected.
4. Minimum cover over piping shall be 3' unless otherwise shown or approved by the NAFI.
5. Earthwork required is in Division 2 of these specifications.

B. Bedding and Backfill:

1. Select Bedding and Fill Installation: Promptly after the pipe is laid, all trenches and excavation shall be backfilled and compacted until it covers the pipe at least 1'. This backfill shall be brought up and tamped equally and thoroughly along each side of the pipe in such a manner as to avoid displacement of or damage to the pipe. The select bedding shall be dumped, spread out, and compacted to 95% relative density. Backfill material shall be thoroughly compacted to a density at least equal to 95% of the maximum density determined by the Standard Proctor in accordance with ASTM D698 Method C including Note 2.
2. No piping shall be laid until the NAFI approves the bedding condition.
3. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.
4. All ledge rocks, boulders, and large stones shall be removed during trench excavation to provide a minimum clearance of 4"–6" below and a minimum clearance of 12" on each side of pipe.

C. Laying Pipe:

1. Comply with manufacturer's instructions, technical specifications, and details on Contract Drawings.
2. Install all pipe accurately to line and grade shown unless otherwise approved by NAFI. Remove and relay pipes that are not laid correctly.
3. Slope piping uniformly between elevations given.
4. Ensure that water level in trench is at least 6" below bottom of pipe. Do not lay pipe in water. Maintain dry trench until jointing and backfilling are complete.
5. Start laying pipe at lowest point and proceed towards the higher elevations, unless otherwise approved by NAFI.
6. Place bell and spigot pipe so that bells face the direction of laying, unless otherwise approved by NAFI.
7. Excavate around joints in bedding and lay pipe so that only the barrel receives bearing pressure from the trench bottom.
8. Permissible deflections at joints shall not exceed the amount allowed by manufacturer.

9. Take every precaution to ensure that no foreign material enters the piping prior to and during installation.
10. All pipe and fittings shall be carefully examined for cracks, damage, or other defects while suspended above the trench before installation. Defective materials shall be immediately removed from site.
11. Interior of all pipe and fittings shall be inspected and all dirt, gravel, sand, debris or other foreign materials shall be completely removed from the pipe interior before it is moved into the trench.
12. Bell and spigot mating surfaces shall be thoroughly wire brushed and wiped clean and dry immediately before pipe is laid.
13. Every time that pipe laying is not actively in progress, the open ends of pipe shall be closed by a watertight plug.
14. Field cutting pipe, where required, shall be made with a machine specially designed for cutting piping. Cuts shall be carefully done, without damage to pipe or lining, so as to leave a smooth end at right angles to the axis of pipe. Cut ends shall be tapered and sharp edges filed off smooth. Flame cutting will not be allowed.
15. Blocking under piping shall be permitted only when accepted by NAFI for special conditions.
16. Touch up protective coatings in a satisfactory manner prior to backfilling.
17. All piping shall be inspected by the NAFI prior to any backfilling operations. The Contractor shall notify the NAFI in advance of any backfilling operation.
18. Water mains shall be laid at least 10' horizontally from any existing or proposed sewer line and where the water main crosses a sewer line, the water main shall be laid above the sewer line to provide a minimum vertical separation of 18" between the outside of the water main and the outside of the sewer line.
19. In addition to Paragraph 3.01.C.18, the Contractor shall protect water supplies in accordance with Section 28 of the Department of Environmental Quality guidance.

D. Jointing Pipe:

1. Clean completely all jointing surfaces and adjacent areas immediately before mating joint.
2. Lubricate and adjust gaskets as recommended by manufacturer.
3. After gaskets are compressed and before pipe is brought fully home, each gasket shall be carefully checked for proper position around full circumference of the joint.
4. Conform to manufacturer's recommendations pertaining to jointing pipe.

E. Restraints, Supports and Thrust Blocks:

1. Install restrained joints as shown, specified, required, and as recommended by the manufacturer.
2. Provide concrete and steel collars, thrust blocks, and cradles as shown or otherwise approved by NAFI.

F. Transitions from One Type of Pipe to Another:

1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or when connecting pipe made by different manufacturers.

- G. Closures:
 - 1. Provide all closure pieces shown or required to complete the Work.
 - 2. Locate closures in straight runs of pipe.
- H. Backfilling:
 - 1. Conform to applicable requirements of the Division 2 Specifications.
 - 2. Backfill by hand and use hand or pneumatic tamping until pipe is covered by at least one foot of backfill.
- I. Concrete Pipe Supplementary Requirements:
 - 1. Conform to Paragraph 3.01.C above, unless otherwise specified and in accordance with applicable recommendations of the following:
 - a. AWWA Manual M9
 - b. Concrete Pipe Handbook
 - 2. Joints: Joints shall be made so that alignment and slope are in accordance with the Drawings. Joints shall be inspected and approved by the NAFI before backfilling.
- J. Movable Sheeting, Trench Boxes or Shields:
 - 1. When using movable trench support, care should be exercised not to disturb the pipe location, jointing or embedment.
 - 2. Removal of any trench protection below the top of the pipe is prohibited after the pipe embedment has been compacted.
 - 3. Movable trench supports shall only be used in either wide trench construction where supports extend below the top of the pipe, or on a shelf above the pipe with the pipe installed in a narrow, vertical-wall subditch.
 - 4. Any voids left in the embedment material by support removal shall be carefully filled with granular material which is adequately compacted.
 - 5. Removal of bracing between sheeting shall only be done where backfilling proceeds and bracing is removed in a manner that does not relax trench support.
 - 6. When advancing trench boxes or shields, prevent longitudinal pipe movement or disjoining.
 - 7. In those instances where the trench support must extend to the bottom of the ditch, a subditch is impractical or native soils are unstable, a simple alteration to the commonly used trench box may be the best alternative. A section $\frac{1}{2}$ the length of the box, with a depth of approximately 2', cut from the bottom of the box will allow the trench shield to ride on the bottom of a narrow trench, while allowing undisturbed pipe embedment in the back half. See Figure 10.15 in Uni-Bell PVC Pipe Association's *Handbook of PVC Pipe - Design and Construction, Fourth Edition*.

3.02 WORK AFFECTING EXISTING PIPING

- A. Location of Existing Piping:
 - 1. Locations of existing piping shown should be considered approximate.
 - 2. The Contractor is responsible for determining exact location of existing piping to which connections are to be made, or which may become disturbed during earth moving operations, or which may be affected by the work in anyway.

3. Conform to applicable requirements of Section 01045, Cutting and Patching.
- B. Work on Existing Pipelines:
1. Cut pipes as shown or required with machines specifically designed for this work.
 2. Install temporary plugs to keep out all mud, dirt, water and debris.
 3. Provide all necessary adapters, fittings, pipe and appurtenances required.

3.03 TESTING OF PIPING

- A. General:
1. The Contractor shall conduct high-pressure hydrostatic leakage test for all filtered water, potable water, and sewer force main piping and deflection test and/or low pressure air test for all gravity sewer piping, as indicated herein.
 2. Notify NAFI 48 hours in advance of testing.
 3. Provide all testing apparatus.
 4. Pipelines which fail to hold specified test pressure or which exceed the allowable leakage rate shall be repaired and retested.
 5. Test pressures required are at the lowest elevation of the pipeline section being tested unless otherwise specified.
 6. Unless otherwise approved, conduct all tests in the presence of the NAFI.
- B. High-Pressure Leakage Test (Pressure Pipe):
1. After the pipe has been laid and backfilled, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of 50 psi unless shown to be different in piping schedule. The duration of each pressure test shall be at least 24 hours.
 2. Each valved section of pipe shall be slowly filled with water and the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) shall be applied by means of a pump connected to the pipe in a manner satisfactory to the NAFI. The pump, pipe connection, gauges and all necessary apparatus shall be furnished by the Contractor. The Contractor shall furnish all necessary assistance for conducting the tests.
 3. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation stops at such points, so that the air can be expelled as the line is filled with water. After all air has been expelled, the corporation chocks shall be closed and the test pressure applied.
 4. All exposed pipe, fittings, valves, hydrants and joints shall be carefully examined during the test. Any cracked or defective pipe, fittings, valves, or hydrants discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material. The test shall be repeated until satisfactory to the NAFI.
 5. A leakage test shall be conducted by the Contractor after the pressure test has been satisfactorily completed. The duration of each leakage test shall be six hours. During the test, the main shall be subjected to a pressure of 50 psi unless shown to be different in the piping schedule.

6. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereto to maintain the specified leakage test pressure after the air in the pipe line has been expelled and the pipe has been filled with water.

7. No pipe installation will be accepted if the leakage is greater than that determined by the formula:

$$L = \frac{(S)(D)(P)^{1/2}}{133200}$$

where L is the allowable leakage in gallons per hour; S is the length of pipe tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in psi gauge.

8. If any test of pipe laid discloses leakage greater than that specified, the CONTRACTOR shall at his own expense locate and repair the defective joints until the leakage is within the specified allowance.

9. All visible leaks shall be repaired regardless of the amount of leakage.

C. Low Pressure Air Test: UNI-Bell's UNI-B-6.

1. Installed gravity sanitary sewer pipe shall be air-tested prior to acceptance.

2. Specified pressure drop of 0.5 psig shall be used to determine the required time the pipe is tested.

3. Sections of installed pipe shall be tested from manhole to manhole.

D. Deflection Test:

1. Two deflection tests shall be performed on all Flexible (PVC and HDPE) gravity sewer pipe. The first test shall be conducted after the final backfill has been in place at least 30 days and prior to final acceptance. The second deflection test shall be made during the eleventh month of the warranty period.

2. No pipe shall exceed a deflection of 5%.

3. If the deflection test is to be run using a rigid ball or mandrel, it shall have a diameter equal to 95% of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

4. The mandrel shall be drawn through the pipe by hand. Irregularities or obstructions encountered in the line shall be corrected by the Contractor.

5. If a section of pipe with excessive deflection is found, the Contractor shall uncover the pipe for inspection. Damaged pipe will be replaced. If the pipe is undamaged, the Contractor may reinstall the bedding and backfill and retest the pipe. Retesting shall include mandrel and low-pressure air testing.

E. Infiltration/Exfiltration Test:

1. The Contractor shall supply needed equipment and personnel to perform the infiltration/exfiltration test on installed gravity pipe 30" and larger.

2. Allowable infiltration/exfiltration shall not exceed 50 gallons per inch of nominal diameter per mile of sewer per day.

3. An exfiltration test shall be performed where the crown of the entire reach of sewer being tested lies less than 5' under the existing water table. Minimum upstream testing head shall be 5' above the existing water table.

4. An infiltration test shall be performed where the crown of the entire reach

- of sewer being tested lies 5' or more under the existing water table.
- 5. Sections of installed piping shall be tested from manhole to manhole.
- 6. The Contractor shall install a calibrated weir at lower end of section being tested and shall measure leakage for a minimum of 4 hours if infiltration test is performed. Provide bulkhead at upper end of pipe section being tested.
- 7. The Contractor shall measure required water to maintain minimum upstream testing head if exfiltration test is performed.

3.04 CLEANING AND DISINFECTION

All piping shall be thoroughly cleaned and flushed in a manner approved by NAFI prior to placing in service. Piping 48" diameter and larger shall be inspected from inside. All debris, dirt and foreign matter removed.

- A. Cleaning:
 - 1. Completely clean interior of all piping and flush piping prior to disinfection with water at a minimum velocity of 2½' per second.
 - 2. Water for flushing, cleaning, and testing shall be furnished and paid for by the Contractor. The Contractor shall provide all temporary piping, hose, valves, appurtenances, and services required.
- B. Disinfection:
 - 1. Disinfect all filtered water piping and potable water piping.
 - 3. Conform to procedures described in AWWA C651 unless otherwise approved by NAFI.
 - 4. Water for testing and chlorination shall be furnished and paid for by the Contractor. The Contractor shall provide all temporary piping, hose, valves, appurtenances, and services required.
 - 5. Chlorine will be supplied by the Contractor.
 - 6. Bacteriologic tests will be sampled by the NAFI or a certified water plant operator of the NAFI and analyzed by the NAFI.
 - 7. Chlorine concentration in the water entering the piping shall be between 50 and 100 parts per million, such that a minimum residual concentration of 25 mg/l will be left after a 24 hour retention period. The operation shall be repeated as necessary to provide complete disinfection.
 - 8. Complete disinfection shall be defined as no coliform present for samples taken on two consecutive days.

END OF SECTION 15052

SECTION 15064 – REINFORCED CONCRETE PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. Furnish all labor, materials, equipment, and incidentals required for reinforced concrete pipe.
 - 2. The extent of piping is shown on the Drawings and in the schedules.
- B. Related Work Specified Elsewhere: Section 15052, Buried Piping Installation

1.02 QUALITY CONTROL

- A. Source Quality:
 - 1. Obtain each type of pipe and fittings from only one manufacturer.
 - 2. Move no concrete pipe or fittings from the casting yard until such pipe or fittings have been cured a minimum of seven days for pipe 6"–27" in diameter and fourteen days for pipe 30" in diameter or larger. Pipe meeting 115% of the 0.01" crack test may be moved before expiration of the stated minimum yard curing time.
 - 3. Special fittings shall be produced by the pipe manufacturer to comply with all respects to the applicable requirements of the specifications.
 - 4. The interior of all pipe shall have true section complying with the internal size(s) specified. All pipe shall be free from fins, bulges, ridges, offsets, projections, defects, or roughness of any kind.
 - 5. Pipe rejected by the NAFI shall be removed from the site.
- B. Reference Standards:
 - 1. ASTM C14, Concrete Sewer, Storm Drain and Culvert Pipe
 - 2. ASTM C76, Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
 - 3. ASTM C188, Concrete Pipe for Drainage
 - 4. ASTM C361, Reinforced Concrete Low-Head Pressure Pipe
 - 5. ASTM A82, Cold Drawn Steel Wire for Concrete Reinforcement
 - 6. ASTM C150, Portland Cement
 - 7. ASTM A185, Welded Steel Wire Fabric for Concrete Reinforcement
 - 8. ASTM A496, Deformed Steel Wire for Concrete Reinforcement
 - 9. ASTM A497, Welded Deformed Steel Wire Fabric for Concrete Reinforcement
 - 10. ASTM A615, Deformed and Plain Billet Steel Bars for Concrete Reinforcement
- C. Inspection: Raw materials, manufacturing processes, and finished concrete piping products are subject to review by the NAFI's Representative at the manufacturer's plant.

1.03 SUBMITTALS

- A. Shop Drawings: Submit detailed drawings and data on pipe, fittings, gaskets, and appurtenances in conjunction with the Shop Drawings required under Section 15052.
- B. Certificates: Submit certificates of compliance with referenced standards.
- C. Lining Affidavit: Submit an affidavit from the coating supplier that all pipe sections, fittings, and specials have been coated in accordance with this specification.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

Comply with the requirements of Section 15052, Paragraph 1.03.

PART 2 - PRODUCTS

2.01 SERVICE CONDITIONS

Comply with Section 15052.

2.02 CONSTRUCTION AND MATERIALS

- A. Pipe and Fittings Standard:
 - 1. Round Pipe: ASTM C76 / AASHTO M-170
 - 2. Arch Pipe: ASTM C506 / AASHTO M-206
- B. Pipe Ends: Pipe length shall be a minimum 8 feet laying length except at manhole or storm drain closures and pipe ends shall be normal to the walls and center of pipe. Flared End Sections shall conform to the connecting pipe standards.
- C. Joints:
 - 1. Joint shall be bell and spigot or tongue and groove type design to provide continuous line or pipe with a smooth interior free from irregularities in the flow line.
 - 2. Joint materials shall be a combination of "O" ring rubber gasket and preformed mastic sealant.
 - 3. "O" ring rubber gasket material shall meet requirements of ASTM C443, latest edition.
- D. Materials of Construction Standards:
 - 1. Cement for Concrete Work: ASTM C150 or ASTM C595
 - 2. Aggregates: ASTM C33
 - 3. Steel Wire Bar Reinforcement: ASTM A82 or ASTM A496
 - 4. Steel Wire Fabric Reinforcement: ASTM A185 or ASTM A997.

2.03 IDENTIFICATION

- A. Clearly mark all items furnished under this Section by waterproof paint, indentation, or as reviewed by the NAFI's Representative to include the following information:

1. Manufacturer's name or trademark
2. Pipe class
3. Specification designation
4. Size
5. Length
6. Date and place of manufacture

2.04 QUALITY CONTROL

Cost of all tests shall be the pipe manufacturer's expense and shall be performed in conformance with Division 01 of the Specifications.

- A. Source Quality:
 1. Obtain each type of pipe and fittings from only one manufacturer.
 2. Move no concrete pipe or fittings from the casting yard until such pipe or fittings have been cured a minimum of seven days for pipe 18 to 27 inches in diameter and 14 days for pipe 30 inches in diameter or larger.
 3. Special fittings shall be produced by the pipe manufacturer to comply with all respects to the applicable requirements of the specifications.
 4. The interior of all pipe shall have true section complying with the internal size(s) specified. All pipe shall be free from fins, bulges, ridges, offsets, projections, defects or roughness of any kind.
 5. Pipe rejected by the NAFI's Representative shall be removed from the site.
- B. Concrete Cylinders: ASTM C39
 1. Two concrete cylinders shall be taken for each 50 sections of pipe.
 2. One cylinder shall be broken at seven days and the second cylinder at 28 days.
- C. Absorption Test:
 1. Made on cylinders taken from pipe barrel.
 2. One cylinder shall be tested for each 50 sections of pipe.
- D. Three-edge Bearing Test: ASTM C497
 1. A four foot section of pipe will be tested for each 100 sections of pipe for each class of pipe supplied.
 2. Each section shall be tested for one-hundredth inch crack and ultimate failure.
- E. Hydrostatic Test: ASTM C443
 1. Three random sections of all pipe sizes required for the project shall be assembled at the manufacturer's production plant.
 2. Test shall be performed to demonstrate that the joint is designed to meet the above specified ASTM.
- F. Vacuum Test: ASTM C1214.
 1. Each individual sanitary sewer pipe section shall be vacuum tested and stamped "Vacuum Tested" after satisfactory test is performed.
 2. Vacuum test can be performed by pipe manufacturer personnel.
 3. Storm sewer pipe does not have to be vacuum tested.

PART 3 - EXECUTION

3.01 INSTALLATION

Comply with Section 15052.

END OF SECTION 15064

SECTION 15100 – BASIC PIPING

PART 1 - GENERAL

1.01 REFERENCE

- A. For specific piping requirements and materials, refer to the respective sections for the various systems.
- B. See Other Sections of these specifications for VALVES, PIPING SPECIALTIES, SUPPORTS, VIBRATION ISOLATION, SEISMIC RESTRAINTS, INSULATION, TREATMENT, TESTING, IDENTIFICATION, and FIRE STOP SYSTEMS.

1.02 THERMAL EXPANSION

- A. Swing joints, turns, pipe anchors, pipe guides, expansion loops or long off-sets shall be provided where necessary to allow for expansion and contraction. Pipe, fittings or equipment, broken during warranty, shall be replaced.

1.03 OPEN ENDS

- A. Keep ends of pipe, including those extending through and above roof, drains, equipment and fixture branches, closed with caps or plugs to prevent dirt or building material from entering the pipe and traps during construction.

1.04 NOISE CONTROL:

- A. Piping shall be free of any objectionable self-generated noise. Isolate piping from building where required preventing transmission of noise.

1.05 CROSS CONNECTIONS

- A. Under any conditions, piping shall not be installed that permits back-siphonage or any flow of polluted water or other liquid into domestic water piping system.
- B. Air gaps, receptor type drains and approved vacuum breaking devices shall be provided. Piping to hose-end faucets or to inlet below fixture overflow shall have vacuum breakers of make, design, size and location approved by the applicable code.

1.06 ACCESS DOORS AND PANELS

- A. Provide access doors for adequate accessibility to valves, drains, traps, and other devices requiring access for maintenance where such devices are concealed within inaccessible ceilings, walls or floors. Access doors minimum size shall be 10" x 12". Access doors shall be coordinated with the NAFI for locations and appearances.

1.07 SUBMITTALS

- A. Submit brochures or other data for approval of all items specified.

1.08 FIRE STOPPING

- A. Provide fire stopping at all pipe penetrations of fire and/or smoke walls and floors.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. All pipe and fittings shall be made in the USA and shall be labeled accordingly.
- B. For materials to be used on the various piping systems, refer to the specific piping sections for the various systems.
- C. FIRE-STOPPING
 - 1. Fire-stopping products shall be 3M, or equal. See Section 15140.
- D. CONDENSATE DRAINS: See Section 15420.
- E. EXPANSION LOOPS: Metraflex metraloop, or equal, same material as piping.
- F. FLEXIBLE PIPE CONNECTORS
 - 1. Double sphere neoprene connectors rated for 150 psi at 220°F. Model MFTFU or MFTNC as manufactured by Mason Industries, Inc. or approved equal.
 - 2. Install control cables when connectors are installed in unanchored piping or connected to isolated equipment and the pressure exceeds values recommended by the manufacturer.
- G. FOUNDATION WALL (BELOW GRADE) PENETRATIONS
 - 1. Link - Seal Thunderline pipe seals.

2.02 ACCESS DOORS AND PANELS

- A. Access doors to 16" x 24" size shall be "VENTLOCK", or equal steel insulated access doors.
- B. Larger access doors shall be steel double panel construction with 1" rigid insulation between panels. Doors with largest dimension over 24", but less than 48", shall use "VENTLOCK" series 200 latches, hinges and gasketing, and construction shall be 22-gage galvanized steel. Doors with largest dimension over 48", shall use "VENTLOCK" series 300 latches, hinges and gasketing, and construction shall be 20-gage galvanized steel.
- C. Access doors shall be UL listed where fire-proofing membranes are penetrated.
- D. Equivalent access doors by Kees, Air Balance, or equal are acceptable.

- E. Access panels shall be HIGH SECURITY or MAXIMUM SECURITY type in secure areas of jail and prisons as approved by the NAFI.

PART 3 – EXECUTION

3.01 ARRANGEMENT

- A. Exposed lines are to be run parallel with, or perpendicular to, building lines and wherever possible shall be grouped together for easier service and identification. Lines requiring a definite grade for drainage shall have precedence in routing over all other lines. Wherever possible, horizontal and vertical lines shall be held as close as possible to walls, ceilings, struts and members so as to occupy minimum space consistent with the proper requirements for insulation, expansion, removal of pipe and access to valves. All concealed work shall finish off within limits permitted by vertical or horizontal chases. Arrange for concealment of all piping in finished area of buildings unless otherwise noted.
- B. Piping shall be worked into place without springing and/or forcing. All piping shall be arranged so as not to interfere with removal of other equipment or devices, not to block access to doors, windows, manholes, or other access openings.
- C. All piping shall be installed so as to avoid liquid or air pockets throughout the work. Piping shall be erected and pitched to insure proper draining. Air vents, manual or automatic shall be installed where required.
- D. All exposed fixture branches shall be chrome-plated.

3.02 ASSEMBLY

- A. All pipes shall be cut square and shall have burr and cutting slag removed by reaming or other cleaning methods.
- B. Unions or flanges shall be used at all connections to all equipment to facilitate dismantling, and elsewhere as required, in the erection of pipe or installation of valves.
- C. All joints and changes of direction shall be made with standard fittings. Bending of pipe will be permitted providing a hydraulic bender is used and pipe is not deformed reducing cross sectional area. Reducers shall be used at pipe size changes.
- D. To prevent electrolysis or corrosion, an insulating dielectric union or fitting shall be used between dissimilar metal fitting and/or pipe. Paper is not acceptable as a dielectrical insulator. Provide an approved insulating method on all underground metallic pipe in contact with dissimilar metals.

- E. Nipples shall be of same material and composition as pipe on which they are installed, and shall be extra heavy when unthreaded shoulder is less than 1-1/2". No running thread nipples will be permitted. Minimum exposed shoulder of any nipple shall not be less than 3/4".
- F. Joints between steel or copper pipe and cast iron shall be made with caulking ferrules.
- G. Cast iron soil pipe and fittings shall be assembled with approved molded push-on type gaskets. Local code approved no hub pipe may be used above grade where applicable.
- H. Galvanized steel pipe shall be assembled with galvanized screwed fittings.
- I. Black steel pipe shall be assembled with screwed or welded fittings. Grooved type mechanical pipe couplings and fittings equal to that manufactured by Victaulic may be used. Weld-O-Let or Thread-O-Let fittings may be used where branch outlet is at least one pipe size smaller than the main. All piping below grade shall be welded.
- J. Copper pipe shall be assembled with wrought copper fittings. All joints shall be made with "SIL-FOS". Pipe, fittings and faucets used for domestic water shall be NSF 61 compliant.

3.03 SUPPORTS

- A. Provide an adequate pipe suspension system in accordance with recognized engineering practices, using, where possible, standard, commercially accepted pipe hangers and accessories. No piping shall be supported by, of from, hangers, supporting electrical conduit.

3.04 SLEEVES AND PLATES

- A. Sleeves shall be used where piping passes through exterior walls; poured-in-place concrete walls, floors or roofs; where required for sealing to meet any sanitation codes, ordinances or laws; and areas where water may accumulate.
- B. Sleeves in poured wall construction, and where collapse is possible, shall be Schedule 40 pipe. Other sleeves shall be minimum 22-gage sheet metal.
- C. Sleeves accommodating insulated pipe shall be of sufficient diameter to pass piping and full-size insulation.
- D. In toilets, kitchens, equipment rooms and other areas where water may have accumulated on the floor, sleeves shall extend 1/2" above the finished floor. Other sleeves shall be flush with finished floor.
- E. After all piping has been inserted in sleeves, voids between pipe or insulation and sleeve shall be filled with packing material to within 1/2" of end of sleeve and then filled with silicone sealant.

- F. Spring clamp plates (escutcheons) shall be provided where pipes are exposed in occupied rooms and where walls, floors or ceilings are finished. Plates on extended sleeves shall have chromeplated skirts.
- G. In firewalls and not on grade floors, provide firestopping at all penetrations. Firestopping materials shall be installed in accordance with the manufacturer's recommendations and UL Listing.

3.05 EXPANSION LOOPS

- A. Provide pipe anchors and pipe guides, and install in accordance with manufacturer's recommendations. Loop joints shall be same as specified for piping system.

3.06 TESTING

- A. Test all piping systems provided under this Contract as hereinafter specified and furnish to the NAFI copies of the test reports signed by the Contractor.
- B. Piping located underground shall be tested and inspected by the governing agency before backfilling.
- C. Equipment and personnel required for these tests shall be furnished without additional cost. Testing equipment shall be as required for particular test, with all equipment and gages accurate and in good working order.
- D. Equipment subject to damage at given test pressure shall be removed from line before pressure is applied. Use proper plugs or caps.
- E. See specific piping system specification for test pressure, duration and medium.

3.07 FLEXIBLE PIPE CONNECTORS

- A. Install flexible pipe connectors where shown on the Drawings and as required by other sections.
- B. Install connectors as close as possible to equipment inlets and outlets.
- C. Support pipe work independently of flexible connectors. Brace and anchor piping as required to prevent movement of piping ends of flexible connectors and align all equipment, pipe work, and flanges so that no flexible connectors shall be misaligned and/or stressed beyond the manufacturer's recommended limits.

END OF SECTION 15100

SECTION 15120 - VALVES

PART 1 – GENERAL

1.01 SUMMARY

- A. Valves specified in this section are for general use. See Specifications for specific system for special valves.

1.02 SUBMITTALS

- A. Submit brochures and other data for approval of all items specified.

PART 2 – PRODUCTS

2.01 GATE VALVES

- A. 1/2" THROUGH 2": Watts B3000, or equal bronze, gate valve, threaded bonnet, non-rising stem, solid wedge disc, 125 psi WSP, 200 psi WOG, screwed ends.
- B. 2½" AND LARGER: Watts 405-NRS-RW, or equal cast iron body, bolted bonnet, resilient wedge, bronze trim 125 psi WSP, 200 psi WOG, flanged ends.

2.02 GLOBE VALVES

- A. 1/2" THROUGH 3": Watts B4000, or equal threaded bonnet, rising stem, bronze disc, 125 psi WSP, 200 psi WOG, screwed ends.

2.03 SWING CHECK VALVES

- A. 1/2" THROUGH 2": Watts B5000, or equal threaded cap, bronze disc, horizontal swing, 125 psi WSP, 200 psi WOG, screwed ends.
- B. 2½" AND LARGER: Watts F511, or equal cast iron body, bronze trim, bolted cover, 125 psi WSP, 200 psi WOG, flanged ends.

2.04 BUTTERFLY VALVES

- A. 2½" THROUGH 6": Watts BF03-121-15 lug style, or equal cast iron body, aluminum bronze pinned disc, stainless steel shaft, lever handle, pressure 200 psi WOG.
- B. 8" THROUGH 12": Watts BF03-121-1G lug style, or equal same as 2 ½" through 6" butterfly valve except with gear operator, pressure 200 psi WOG.

2.05 BALL VALVES

- A. 1/2" THROUGH 2": Watts B6800, or equal three piece forged brass, full port, screwed ends.

- B. 2½" THROUGH 4". Watts G4000, or equal cast iron full port, flanged ends 125 WSP.

2.06 BALANCING VALVES

- A. ½" THROUGH 2": Watts WSM-81, or equal flow measurement valve with bronze and balancing ports, screwed ends. (Domestic water only).
- B. 2½" THROUGH 3": Watts WSM-81, or equal flow measurement valve with cast iron body and balancing ports, flanged ends. (Domestic water only).

2.07 SPRING CHECK VALVES

- A. ½" THROUGH 2": Watts No. 600, or equal bronze silent check, treaded end, 400 psi WOG.
- B. 2½" AND LARGER: Watts ICV-125, or equal: Standard ASTM A216 cast iron body with aluminum-bronze disc plates with PTFE bearings and 316 stainless steel springs, 200 psi CWP (non-shock), and silent check valve.

2.08 GAS COCKS

- A. 1/2" THROUGH 2": Milliken #170M, or equal Class 125, cast iron body and plug, lubricated, wrench operated, screwed ends.
- B. 2-1/2" THROUGH 4" : Milliken #171M, or equal Class 125, cast iron body and plug, lubricated, wrench operated, flanged ends.

PART 3 – EXECUTION

3.01 JOB CONDITIONS

- A. Valves specified under specific systems shall take precedence over those as specified herein.
- B. Valves in copper pipe shall have threaded ends (except where size dictates flanged ends), use copper to MPT adapters.
- C. The use of threaded ends or flanged ends is the Contractor's option within the size listed.

3.02 ARRANGEMENTS OR LOCATIONS

- A. Valves shall be located in an accessible position or made accessible through access panels. Refer to Section 15100 for access panels.
- B. Where several valves are related as to function, they shall be grouped in a battery.
- C. No valve shall be installed with stem below horizontal position without prior approval.

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- D. Provide special handles or operators as might be required or as indicated on the drawings.

END OF SECTION 15120

SECTION 15120A – VIBRATION ISOLATION**PART 1 – GENERAL****1.01 SCOPE**

- A. Unless otherwise noted on the equipment schedule, all mechanical equipment shall be mounted or suspended on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonable uniform deflection.
- B. All piping over 1" outside diameter located in mechanical equipment rooms, and for a minimum of fifty (50) feet or 100 pipe diameters, whichever is greater, from any connection to vibration isolated mechanical or electrical equipment shall be isolated from the building structure by means of noise and vibration isolation hangers. All piping in the building, which is connected to vibration isolated equipment shall be isolated at connections to the building structure.
- C. All ductwork located in mechanical equipment rooms, and for a minimum of fifty (50) feet from any connection to vibration isolated air moving equipment shall be isolated from the building structure by means of noise and vibration isolation hangers.
- D. All piping and ductwork vertical risers shall be isolated from the building structure by means of noise and vibration isolation guides and supports.
- E. All piping and ductwork to be isolated according to this section of the specification shall freely pass through walls and floors without rigid connections. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork, and maintain a minimum of 3/4" and maximum of 1-1/4" clearance around the outside surfaces. This clearance space shall be tightly packed with 1.58 P.C.F. glass fiber and shall be caulked airtight after installation of the piping or ductwork.
- F. Approval for substitution of "Internally Isolated" mechanical equipment in lieu of the specified isolation of this section must be secured for individual equipment units a minimum of ten (10) days prior to the project bid date.

1.02 SYSTEM DESIGN

- A. The isolation materials manufacturer shall be responsible for the proper selection of isolators to accomplish the specified minimum static deflections, for all isolators, based on the actual weight distribution of equipment to be isolated.
- B. The isolation materials manufacturer shall be responsible for the structural design of steel beam bases and concrete inertia bases, to support mechanical equipment scheduled to receive such supplementary base.
- C. The contractor shall furnish a complete set of approved shop drawings of all mechanical equipment to receive vibration isolation devices to the vibration

isolation materials manufacturer, based upon which the selection of vibration isolators and design of supplementary bases will be completed. The shop drawings to be furnished shall include operating weights of the equipment to be isolated and the distribution of weight at support points.

- D. The contractor shall furnish a complete layout of piping and ductwork to be isolated, including vertical risers, showing size or weight and support points of the piping or ductwork system, to the vibration isolation materials manufacturer, for selection and layout of isolation hangers.

1.03 SUBMITTALS

- A. The Contractor shall have prepared by the isolation materials manufacturer, and shall submit to the NAFI for approval, drawings showing the construction of the isolation devices to be used, including specific selection of isolators for the equipment to be furnished for this project, and shall include the complete design of supplementary bases; a tabulation of the design data for each isolator, including spring OD, free operating, and solid heights, and ratio of horizontal to vertical stiffness, and other required data to clearly indicate that the specified isolator types and minimum static deflections are provided by the system submitted.

PART 2 – PRODUCTS

2.01 QUALITY CONTROL - VIBRATION ISOLATORS

- A. All vibration isolation materials specified herein shall be provided by a single manufacturer to assure single source responsibility for the proper performance of materials used.
- B. Subject to compliance with requirements, provide vibration isolation as manufactured by one of the following or approved equal:
 - 1. B-Line Systems, Inc.
 - 2. Kinetics Div. of Peabody Noise Control.
 - 3. Mason Industries, Inc.

2.02 ISOLATOR TYPES

- A. TYPE 1, FLOOR-MOUNTED EQUIPMENT
 - 1. Vibration isolators shall be precompressed molded fiberglass pads individually coated with a flexible, moisture impervious elastomeric membrane. Vibration isolation pads shall be molded from glass fibers with fiber diameters not exceeding 0.00027 in. and with a modulus of elasticity of 10.5 million PSI. Natural frequency of fiberglass vibration isolators shall be essentially constant for the operating load range of the supported equipment. Vibration isolators shall be color coded or otherwise identified to indicate the load capacity. Vibration isolators shall be selected by the manufacturer for each specific application to comply with deflection requirements as shown on the Vibration Isolation Schedule

- or as indicated on the project documents. Vibration isolation pads shall be Model KIP, as manufactured by Peabody Noise Control, Inc., or equal.
2. Vibration isolators shall be as described above but bonded to a steel load transfer plate and a formed steel bolt- down bracket, and shall also include an equipment mounting bolt with an anti-short circuit neoprene grommet. Anchored vibration isolators shall be Model AC as manufactured by Peabody Noise Control, Inc., or equal.
 3. Vibration isolators shall be neoprene, molded from oil-resistant compounds, with cast-in-top steel load transfer plate for bolting to supported equipment and a bolt-down plate with holes provided for anchoring to supporting structure. Top and bottom surfaces shall have non-skid ribs. Neoprene vibration isolators shall have minimum operating static deflections as shown on the Vibration Isolation Schedule or as indicated on the project documents but not exceeding published load capabilities. Neoprene vibration isolators shall be Model RD, as manufactured by Peabody Noise Control, Inc., or equal.

B. TYPE 1, SUSPENDED EQUIPMENT

1. Vibration isolators with maximum static deflection requirements under the operating load conditions not exceeding .40" shall be hangers consisting of an elastomer-in-shear insert encased in a welded steel bracket and provided with a stamped load transfer cap. The elastomer insert shall be neoprene, molded from oil resistant compounds and shall be neoprene, molded from oil resistant compounds and shall be color-coded to indicate load capacity and selected to operate within its published load range.
2. The hanger bracket shall be designed to carry a 500% overload without failure and to allow a support rod misalignment through a 30-degree arc without metal-to-metal contact or other short circuit. Vibration isolation hanger assembly shall be Model RH, as manufactured by Peabody Noise Control, Inc., or equal.

C. TYPE 2, FLOOR-MOUNTED EQUIPMENT

1. Vibration isolators shall be freestanding, unhoused, laterally stable steel springs wound from high strength spring steel. Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity. Springs shall be selected to provide operating static deflections shown on the Vibration Isolation Schedule or as indicated on the project documents. Springs shall be color coded or otherwise identified to indicate load capacity. Springs shall be assembled between a top and bottom steel load plate. The upper load plate shall be provided with a steel leveling bolt lock-nut and washer for attachment to the supported equipment. The lower load plate shall have a non-skid noise isolation pad bonded to the bottom and have provisions for bolting the isolator to the supporting structure. Spring isolation mounts for floor mounted equipment shall be Model FDS, as manufactured by Peabody Noise Control, Inc., or equal.

D. TYPE 2, SUSPENDED EQUIPMENT, PIPING, & DUCTWORK

1. Vibration isolators for suspended equipment, with minimum static deflection requirement exceeding 0.4" shall be hangers consisting of a free-standing, laterally stable steel spring and elastomeric washer in

series, assembled in a stamped or welded steel bracket. The spring element shall meet all the specified characteristics described in Section 2.02.C, first paragraph. Vibration isolation hangers shall be Model SH, as manufactured by Peabody Noise Control, Inc., or equal.

2. Vibration isolators for suspended equipment with minimum static deflection requirement exceeding 4", and where both high and low frequency vibrations are to be isolated, shall be hangers consisting of a laterally stable steel spring in series with a precompressed molded fiberglass insert, complete with load transfer plated and assembled in a stamped or welded steel bracket. The fiberglass insert element shall meet all the specified characteristics described in Section 2.02.A, first and second paragraphs. The spring element shall meet all the specified characteristics described in Section 2.02.C, meet all the specified characteristics described in Section 2.02.B, third paragraph.
3. The combination isolation hanger assembly with fiberglass inserts shall be Model SFH, as manufactured by Peabody Noise Control, Inc., or equal.

E. TYPE 3, RESTRAINED SPRING ISOLATORS

1. Vibration isolators for equipment which is subject to load variations and large external or torquing forces shall consist of large diameter laterally stable steel springs assembled into formed or welded steel housing assemblies designed to limit vertical movement of the supported equipment. Housing assembly shall be formed or fabricated steel members and shall consist of a top-load plate complete with adjusting and leveling bolts, vertical restraints, isolation washers and a bottom plate with non-skid noise stop pads and holes provided for anchoring to supporting structure. Spring elements shall meet all the specified characteristics described in Section 2.02.C, first paragraph. Vibration isolators shall be Model FLS, as manufactured by Peabody Noise Control, Inc., or equal.

2.03 BASE TYPES

A. TYPE 1, STRUCTURAL RAIL BASES

1. Bases shall be structural beam sections, with welded on isolator support brackets and prelocated and drilled anchor bolt holes or skids, and shall be designed and supplied by the isolation materials manufacturer. Beam sections shall not be structurally connected to each other. Minimum section depth of each member shall be equal to 8% of the longest span between supporting isolators, or as shown on the drawings or indicated on the project documents. Isolator support brackets shall be welded to the structural beams as required to obtain the lowest mounting height for the supported equipment. Structural Rail Bases shall be Model SBB, as manufactured by Peabody Noise Control, Inc., or equal.

B. TYPE 6, INTEGRAL STRUCTURAL RAIL BASES

1. Bases shall be fabricated from structural beam sections as described above, except that lateral cross members will be added to form a structurally integral, welded frame to provide a rigid, distortion-free common frame to support and anchor separate equipment components or

driving and driven members. Structural fabricated bases shall be Model SFB, as manufactured by Peabody Noise Control, Inc., or equal.

C. TYPE 7, CONCRETE INERTIA BASES

1. Bases shall be constructed of concrete cast into a prefabricated inertia base frame assembly designed and supplied by the isolation materials manufacturer. Frame members shall be welded to form a structurally integral assembly, complete with primer-painted steel perimeter members, welded and tied reinforcing rods, recessed isolator brackets and equipment anchoring bolts. Bases shall be shipped ready for pouring of concrete fill in the field. Concrete inertia bases shall be Model CIB, as manufactured by Peabody Noise Control, Inc., or equal.

D. TYPE 8, ROOF CURB RAILS

1. Rails to support rooftop equipment shall be designed to provide isolation against the transmission of vibrations to the building structure. Rail assembly shall consist of extruded or roll-formed top and bottom members with spring isolators incorporated and with a continuous air and water seal provided for the entire rail perimeter. Spring isolators shall be selected and spaced according to weight distribution. Spring components shall meet all the specified characteristics described in Section 2.02.C, first paragraph. Roof Curb Rails shall be Model ASR, AS manufactured by Peabody Noise Control, Inc., or equal.

2.04 VIBRATION ISOLATOR SELECTION

- A. Noise and vibration isolator types, minimum operating static deflections, and supplemental bases shall be provided for individual mechanical equipment units according to selection criteria delineated in the table incorporated as part of this specification or as tabulated in the equipment schedules of the project drawings.
- B. Noise and vibration isolator types and minimum operating static deflections for suspended or floor mounted piping shall be as follows:
 1. Types 1 and 2 hangers, or Type 2 floor mounts, with minimum operating static deflections equal to 50% of connected equipment isolator deflection, or one (1) inch, whichever is greater, shall be used to support all piping over one (1) inch outside diameter located within mechanical equipment rooms, traveling between equipment rooms, and for a minimum of 50 feet or 100 pipe diameters, whichever is greater, from connections to vibration isolated mechanical or electrical equipment.
 2. Type 1 hangers or floor mounts, with a maximum natural frequency of 12 Hz. shall be used to support all piping throughout the building which is connected to vibration isolated equipment, and not specified to receive Type 2 isolators.
 3. All piping connected to fire pumps or sprinkler systems is excluded from vibration or noise isolation requirements.
- C. Noise and vibration isolator types and minimum operating static deflections for suspended, or floor mounted, sheet metal ductwork air plenums, pressure reducing valves, sound traps and similar air distribution elements shall be as follows:

1. Type 2 hangers, or Type 2 floor mounts with minimum operating static deflections equal to 50% of connected equipment isolator deflection, or one (1) inch, which ever is greater, shall be used to support all sheet metal air distribution elements located within mechanical equipment rooms, traveling between equipment rooms, and for a minimum of 50 feet from connections to vibration isolation mechanical equipment.
- D. Isolator types are scheduled to establish minimum standards. At the contractor's option, labor saving accessories can be an integral part of isolators supplied to provide initial lift of equipment to operating height, hold piping at fixed elevations during installation and initial system filling operations, and similar installation advantages, provided isolators supplied incorporate the specified isolator type, and do not degrade the noise and vibration isolation of equipment mounted.
- E. Supplemental equipment bases Type 2 and 3 as required shall be provided for all mechanical equipment having non-unitary driving and driven members, or equipment configurations such that mounting on vibration isolators would cause increased strain on connected piping or ductwork if supplemental bases are not provided.

2.05 QUALITY CONTROL - FLEXIBLE CONNECTORS

- A. All flexible connectors specified herein shall be provided by a single manufacturer to assure single source responsibility for the proper performance of materials used.
- B. Subject to compliance with requirements, provide flexible connectors as manufactured by one of the following:
 1. Mason Industries, Inc.
 2. Metraflex Company
 3. Approved equal

2.06 CONNECTOR TYPES

- A. TYPE 1, RUBBER SPHERICAL
 1. Flexible neoprene or EPDM connectors shall be used on all pipe connections to pumps, air handling units and other vibration-causing devices within mechanical equipment rooms except boilers or heat exchangers. They shall be manufactured of multiple plies of nylon tire cord and EPDM both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement. Connectors shall have two spheres. Connectors up to and including 1-1/2" may have threaded ends. Connectors 2" and larger shall be manufactured with floating galvanized flanges recessed to lock the connector's raised face neoprene flanges. Hoses shall be connected on the equipment side of shut-off valves. Connectors shall be rated at a minimum of 150 psi at 220 F. All connections shall be made with spheres properly pre-extended as recommended by the manufacturer to prevent additional elongation under pressure. Connectors 12" and larger operating above 100 psi shall employ control rods with end fittings isolated by means of 1/2" thick bridge bearing neoprene washer bushings designed for a maximum of

1,000 psi. Connectors shall be type MFTFU or MFTFC as manufactured by Mason Industries, Inc., or equal.

B. TYPE 2, STAINLESS STEEL

1. Stainless steel hoses shall be used on all piping connections to pumps, air handling units, coils and other vibration producing devices outside of mechanical equipment rooms and at piping connections to boilers and heat exchangers. Hoses shall have stainless steel braid and carbon steel braid and carbon steel flanges. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples. Lengths shall be as tabulated:

Flanged		Male Nipples	
3" x 14"	10" x 26"	½" x 9"	1 ½" x 13"
4" x 15"	12" x 28"	¾" x 10"	2" x 14"
5" x 19"	14" x 30"	1" x 11"	2 ½" x 18"
6" x 20"	16" x 32"	1 ¼" x 12"	
8" x 22"			

Hoses shall be installed on the equipment side of shut-off valves, horizontally and parallel to the equipment shafts wherever possible. Hoses shall be type BSS as manufactured by Mason Industries, Inc., or equal.

PART 3 – EXECUTION

3.01 EXECUTION

- A. Installation of all vibration isolation materials and supplemental equipment bases specified in this section shall be accomplished as per manufacturer's written instructions.
- B. No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation system herein specified. Coordinate with Division 16 to assure flexibility of electrical connections to isolated equipment.

END OF SECTION 15210A

SECTION 15220 – MECHANICAL SUPPORTING SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

- A. Provide adequate pipe, equipment foundation and suspension systems in accordance with recognized engineering practices, using, where possible, standard, commercially accepted hangers and accessories.

1.02 CODES

- A. All pipe hangers and supports shall conform to the latest requirements of the Code for Pressure Piping, Refrigeration Piping ANSI/ASME B31.5-74 and Manufacturers' Standardization Society of Valve & Fittings Industry Documents MSS-SP-58-75 and MSS-SP-69-76.
- B. All auxiliary steel necessary for the installation of the pipe hangers and supports shall be designed in accordance with the AISC 2005 Specification and Requirements of Section 05500 MISCELLANEOUS METALS, and as indicated on the Drawings.
- C. Supporting systems shall comply with local mechanical and plumbing codes.

1.03 DESIGN

- A. Supporting Steel not shown for the equipment will be designed, supplied and erected by the Contractor. (The supporting steel is that steel which is connected to the structure shown on the Drawings and carries the weight of the mechanical items.) This supporting steel design must carry the dead weight and dynamic load imposed by the equipment.
- B. The supporting steel shall be connected to the structure in such a manner as not to overload the structure. It is the responsibility of the general contractor, mechanical contractor and the steel fabricator to verify that this purpose is accomplished. It is the responsibility of the general contractor to call to the attention of the NAFI any deficiency prior to bidding.
- C. Where thermal movement in the pipe line will occur, the pipe hanger assembly must be capable of supporting the line in all operating conditions. Accurate weight balance, calculations shall be made to determine the supporting force at each hanger in order to prevent excessive stress in either pipe or connected equipment.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Numbers refer to GRINNELL; equal devices by B-Line, or approved equal will be acceptable.

2.02 CONCRETE INSERTS

- A. Inserts shall be Figures 281, 282 or Powerstrut 359 stanchion where a continuous insert is required.

2.03 BEAM & STEEL JOIST CLAMPS

- A. Clamps shall be Figures 133, 134, 218, 225, 226, 228, or 292. Clamps are not approved except where seismic bracing is not required by local code.

2.04 RISER CLAMPS

- A. Riser clamps shall be Figure 261, for steel pipe or Figure CT121 for copper tubing.

2.05 HANGER RODS

- A. Hanger rods shall be Figures 140 and 146. Eye rods shall be Figures 248 and 248L.

2.06 PIPE HANGERS

- A. All hangers for piping 2" or larger shall be provided with means of vertical adjustment.
- B. On uninsulated steel pipe, hangers shall be Figures 104, 108, 212, or 260. On piping 2" and smaller, Figures 70, 97, or 138R will be permitted.
- C. On uninsulated copper tubing, hangers shall be Figures CT-65, CT-69, CT-99, CT-109, OR CT-122R.
- D. On hot insulated steel pipe, hangers shall be Figure 295 or welded attachments, Figure 60. Where thermal movement causes the hanger rod to deviate more than 5° from the vertical, or where longitudinal expansion causes a movement of more than 1/2" in the piping supported from below, roller hangers Figures 171, 181, 271, or 274 shall be used in conjunction with a protection saddle. Figures 160 thru 165 to suit the insulation thickness. On insulated steel pipe for chilled or hot water or similar service, the hanger must be placed on the outside of the insulation with a Figure 167 Shield.
- E. On insulated copper tubing, hangers shall be Figures 70, 97, 104, or 108 and shall be placed on the outside of the insulation with a Figure 167 Shield. The Figure 167 Shield shall be applied to distribute the hanger load over the insulation and to eliminate damage to the vapor barrier on the covering.
- F. Base supports shall be Figures 259 or 264.

2.07 BRACKETS AND RACKS

- A. Welded steel brackets shall be Figures 194, 195 and 199. Multiple pipe racks or trapeze hangers shall be fabricated from Powerstrut channel and accessories.

2.08 GUIDES AND SLIDING SUPPORTS

- A. Guides shall be Figures 171, 175, 177, or 256. Sliding supports shall be Figures 280, 432, 435, 436, 437, or 438.

2.09 ROOF PIPE SUPPORTS

- A. Piping installed above roof and/or where indicated shall be supported by PATE or RPS Pipe Mounting Pedestals anchored on RPS Equipment Rails of the size suitable for the pipe in full compliance of the manufacturer's recommendations.

2.10 ROOF PENETRATIONS

- A. Duct and pipe roof penetrations shall be made with PATE or ROOF PRODUCTS AND SYSTEMS CORP. devices, installed as recommended by the manufacturer.

2.11 ROOF MOUNTED EQUIPMENT

- A. Except where roof curbs are specified to be furnished with equipment, set all roof mounted equipment on Custom Curb Inc., or as approved, Model CES, 12" high. Coordinate base with insulation and roof. Install as recommended by manufacturer.

PART 3 – EXECUTION

3.01 ATTACHING TO STRUCTURE

- A. Where equipment or piping is supported off a concrete structure, inserts shall be used. Where support rod sizes exceed 7/8" diameter or where the pipe load exceeds the recommended load for the insert, use 2 inserts with a trapeze type connecting member below the concrete. In cases where pipes are supported from existing slab, use Phillips; "RED HEAD" or equal, sized for Safety Factor 4.
- B. Where equipment or piping is supported from building steel beam, welded beam attachments shall be used. Holes drilled in building steel for hanger support rods will not be permitted. Clamps may be used where seismic bracing is not required by local code.
- C. All vertical runs of piping shall be supported at each floor.

3.02 HANGER RODS AND SPACING

- A. Where hanger rod sizes are catalog-listed for a specified hanger, this size shall govern. Where hanger rod sizes are not catalog-listed, the load on the hanger shall be the determining factor and the maximum recommended hanger rod load as catalog-listed, shall govern.

- B. Pipe hangers shall be at each change in direction, not more than 2'-0" from end of run and on straight runs at each joint or the spacing shall not exceed which ever is closer:

<u>PIPE SIZE</u>	<u>STEEL PIPE</u>	<u>COPPER</u>	<u>PVC, DWV PVC, CPVC</u>	<u>POLYPROPYLENE /ACID WASTE</u>
To 3/4"	7'-0"	5'-0"	3'-0"	1'-6"
1" To 2"	10'-0"	8'-0"	4'-0"	2'-0"
2-1/2" To 4"	12'-0"	10'-0"	5'-0"	2'-6"
5" To 8"	16'-0"	10'-0"	6'-0"	3'-0"
10" and Larger	20'-0"	10'-0"	8'-0"	4'-0"

Pipe hangers for PVC piping shall be as recommended by the manufacturer for the service temperature, but not more than listed above unless information is submitted with the shop drawings showing manufacturer recommended spacing.

- C. Provide supports at concentrated loads such as equipment, in-line pumps, valves and other piping specialties, to prevent line sag and/or excess stress in the piping systems.
- D. For cast iron pipe provide hanger at each joint or fitting with a maximum spacing of 5'-0" on center.
- E. Where distance between riser clamp and hanger exceed 10'-0" in height, intermediate clamps shall be installed to provide support or alignment as a maximum of every 10'-0".

3.03 AUXILIARY STEEL

- A. Furnish all miscellaneous structural members necessary to hang or support pipe or mechanical equipment. Material of members shall be consistent with that of the main structural system.
- B. All auxiliary steel shall receive one shop coat of primer paint prior to installation.
- C. Notify NAFL of any adjustment necessary in main structural system for proper support of major equipment.

3.04 CONCRETE PADS

- A. Provide concrete pads under all floor-mounted equipment and apparatus. Dowel into structural floor slab.
- B. All pads shall be a nominal 4" thick except 12" for pumps. Make pads thicker than 4" if necessary to obtain required condensate drainage.
- C. Unless otherwise detailed, slabs for chillers shall be 6" thick and isolated from main floor slab with a bituminous strip.
- D. See Vibration Isolation and Seismic requirements for additional work.

END OF SECTION 15220

SECTION 15230 – MECHANICAL IDENTIFICATION**PART 1 – GENERAL****1.01 PIPE IDENTIFICATION**

- A. All piping in mechanical spaces, in unfinished space, and above lift out ceilings, shall be identified with pressure-sensitive pipe markers with color bands of the proper size. Markers shall have proper legend and meet OSHA Specifications and the latest requirements of ANSI A13.1. Where pipes are too small for such application, a 1-1/2" brass tag shall be used. Do not identify exposed piping in the finished areas.
- B. Markers shall be applied to the piping at the following locations:
 - 1. Adjacent to each valve.
 - 2. At each branch and riser take-off.
 - 3. At each pipe passage through wall, floor and ceiling construction.
 - 4. At each pipe passage to underground.
 - 5. At not more than 40'-0" spacing on straight pipe runs.
- C. Markers shall be placed so as to be easily read. Arrows shall be applied to indicate direction of flow.

1.02 DAMPER, VALVE AND EQUIPMENT IDENTIFICATION

- A. Provide brass tags for all valves with legend describing function of each valve. Tag shall also indicate normally open or normally closed.
- B. Provide nameplates for all mechanical equipment.
- C. Provide damper tags on each balancing damper located in Ventilating (Indoor Air Quality) Air System.

1.03 HVAC AND REFRIGERATION EQUIPMENT

- A. A permanent factory applied nameplate(s) shall be affixed to equipment on which shall appear in legible lettering, the manufacturer's name or trademark, the model number, the serial number, and the seal or mark of the testing agency. A label shall also include the following:
 - 1. Electrical Equipment: Electrical rating in volts, amperes, and motor phase; identification of individual electrical components in volts, amperes or watts, motor phase, BTU output, and required clearance (if clearances are specified).
 - 2. Absorption Units: Hourly rating in BTU; minimum hourly rating for units having step or automatic modulating controls; type of fuel, type of refrigerant; cooling capacity in BTU, and required clearance (if clearances are specified).
 - 3. Fuel-Burning Units: Hourly rating in BTU, type of fuel approved for use with the appliance, and required clearance (if clearances are specified).
 - 4. Heating, Cooling, and Refrigeration Appliances: Name and trademark of the manufacturer; the catalog (model) number or equivalent, the electric

rating in volts, amperes, and phase; BTU output rating; Amount and type of refrigerant; design pressures applied; individual marking for each electrical component in volts, amperes or watts, and phase; required clearances from combustibles; a seal indicating approval of the appliance by an approved testing agency.

PART 2 – PRODUCTS

2.01 VALVE TAGS

- A. Brass tags shall be minimum of 2" diameter to accommodate 1/2" high numbers and 1/4" high letters. Tag shall be equipped with a brass chain, monel meter seal, or brass "S" hook.

2.02 PIPE MARKERS & BANDS

- A. Markers and band sizes shall conform to the following:

<u>OUTSIDE DIAMETER OF PIPE OR INSULATION</u>	<u>LENGTH OF COLOR FIELD</u>	<u>LETTERING HEIGHT</u>
3/4" to 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

- B. Marker and band colors, and marker legends shall conform to the following.

<u>PIPING SYSTEM</u>	<u>LEGEND</u>	<u>BAND/LETTER COLOR</u>
1. DOMESTIC WATER SYSTEM		
Cold Water	Cold Water	Green/White
Hot Water	Hot Water	Yellow/Black
Hot Water Return	Hot Water Return	Yellow/Black
2. GAS PIPING SYSTEM		
Natural Gas	Low Pressure Gas	Yellow/Black
3. SANITARY SEWER SYSTEM		
Sanitary Waste	Sanitary Sewer	Green/White
Sanitary Vent	Plumbing Vent	Green/White
4. STORM DRAIN SYSTEM		
Storm Drain	Storm Sewer	Green/White
5. CHILLED WATER PIPING SYSTEM		
Chilled Water Supply	Cooling Supply	Green/White
Chilled Water Return	Cooling Return	Green/White

6. FIRE PROTECTION SYSTEMS

Fire Protection Water	Fire Protection Water	Red/White
Fire Sprinkler Water	Fire Sprinkler Water	Red/White
Dry Sprinkler System	Dry Sprinkler System	Red/White

- C. Arrows shall be of same color as bands and shall be point in direction of flow, and indicate normal working pressure.
- D. Damper tags and equipment nameplates shall be white on black laminated plastic.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Legends shall be securely fixed to the pipes with full circumference bands on each side of legend. Arrow downstream of legend shall have a full circumference band at the arrow end.
- B. Valve tags shall be numbered in accordance with a valve chart, which shall be framed and mounted where directed by NAFI. Said chart shall describe valve location and function.
- C. Equipment nameplates shall be labeled the same as shown on the contract documents and shall be securely attached to the equipment.
- D. Damper tags shall be lettered to say: "THIS DAMPER HAS BEEN ADJUSTED TO MEET INDOOR AIR QUALITY STANDARDS. DO NOT TAMPER."

END OF SECTION 15230

15250 – MECHANICAL SYSTEMS INSULATION

PART 1 – GENERAL

1.01 SUMMARY

A. Work Includes:

1. Furnish and install all insulation for HVAC piping, duct and equipment and for plumbing piping. Insulation shall comply with the energy code as a minimum unless specified below.

1.02 QUALITY ASSURANCE

- A. Insulation specified is intended to set a standard. Insulation by other manufacturers will be considered provided that characteristics meet or exceed specified material. Each substitute item shall be submitted for approval.
- B. Specifications apply to all ductwork except exhaust unless specifically specified or indicated otherwise. See the drawings for additional specific requirements. Insulation may also be required for certain exhaust ducts when indicated on the drawings or in these specifications.
- C. Insulating materials shall comply with flame spread, smoke developed, and other applicable requirements of local and state Fire Codes and NFPA 90A, UL 723 or ASTM E-84. Before applying any insulation, submit satisfactory evidence of this compliance.
- D. It is the intent of this Section of the Specifications that all cold surfaces subject to "sweating" shall be insulated and have a vapor barrier applied
- E. Installer Qualifications: Insulation contractor installing this insulation system must be experienced with similar type systems and products.
- F. Furnish insulation thickness in excess of that specified herein if so indicated on the drawings.

PART 2 – PRODUCTS

2.01 PLUMBING

- A. DOMESTIC COLD WATER (ABOVE-GRADE): Owens-Corning or Knauf 1/2" thick fiber glass, one piece, pipe insulation with factory-applied White All Service (ASJ) Vapor Barrier Jacket. Fittings shall be molded or mitered fiber glass for sizes under 3" and molded fiber glass for sizes 3" and larger.
- B. DOMESTIC HOT WATER (ABOVE-GRADE): Owens-Corning or Knauf 1" thick fiber glass, one-piece, pipe insulation with factory-applied White All-Service (ASJ) Vapor Barrier Jacket. Fittings shall be OC-110 Cement for sizes under 3" and molded fiber glass for sizes 3" and larger.

- C. DOMESTIC HOT WATER (BELOW-GRADE): Pittsburgh Corning "FOAMGLAS" 1" thick or Dow Chemical Trymer 2000 @ 1" thickness. Fittings shall be molded or mitered of "FOAMGLAS" or Trymer 2000. Trench to be constructed with stone bedding. Trench to be sand backfilled.

TRYMER brand rigid foam insulation to be wrapped with a tough puncture resistant vapor retarder jacketing. No additional outer mechanical jacketing is required.

Acceptable Vapor Retarder Manufacturers for underground installation:

Saran **560** Vapor Retarder Film and Saran Tape manufactured by The Dow Chemical Company; or Rubberized bituminous membrane material with a minimum 50 mils thickness.

- D. AIR CONDITIONING UNIT CONDENSATE DRAINS: Armstrong's AP Armaflex Pipe Insulation ½" thick (Freezer and Refrigerator drains same as domestic cold water).

2.02 HVAC DUCTWORK

- A. RECTANGULAR DUCTWORK (MAX. DIMENSION 30"): Owens-Corning or Knauf 2" thick fiberglass duct wrap with factory-applied flame-retardant foil-reinforced Facing (FRK/FSK), 3/4 lb. Density. Use semi-rigid insulation for ductwork in finished spaces and for exposed ducts within eight (8) feet of the floor. Ductwork shall be both internally and externally insulated when indicated on the drawings. See paragraph "D" below for ducts exposed in equipment rooms and ducts with maximum dimension greater than 30".
- B. ROUND AND OVAL DUCT WORK: Owens-Corning or Knauf 2" thick (3" thick in attics) fiberglass faced duct wrap with factory-applied flame-retardant foil-reinforced Facing (FRK/FSK) 0.75 PCF density. For exposed ductwork within eight (8) feet of the floor, cover with aluminum jacket same as specified for ductwork exposed to weather; delete weather-proofing.
- C. RECTANGULAR DUCTWORK (INTERNALLY LINED): Refer to Section 15800 and the drawings for requirements.
- D. RECTANGULAR DUCT WORK (MAX. DIMENSION GREATER THAN 30", AND DUCTWORK EXPOSED IN EQUIPMENT ROOMS UP TO 8'-0" ABOVE THE FLOOR): Owens-Corning or Knauf 2" with foil scrim kraft (FSK) semi-rigid duct insulation having a minimum density of 3.0 PCF. Ductwork shall be both internally and externally insulated when indicated on the drawings.
- E. DUCTWORK EXPOSED TO WEATHER: Owens-Corning or Knauf 2" with foil scrim Kraft (FSK) semi-rigid duct insulation having a minimum density of 6.0 PCF.

2.03 GREASE DUCT AND FLUE FIRE PROTECTION

- A. Insulate the grease duct and flues for a two hour rating.

PART 3 – EXECUTION

3.01 GENERAL

- A. The application of all insulation shall be performed by experienced mechanics, regularly employed in the trade, in a neat and workmanlike manner. Unless otherwise specified to a greater quality, the application of all insulation shall be in accordance with the manufacturer's recommendations.
- B. Omit insulation from the following items:
 - 1. Exposed plated plumbing pipe.
 - 2. Pipe vents to atmosphere, discharge from safety and relief valves, overflow pipes, and hot only drain pipes.
 - 3. Valves, Unions, Flanges, Traps, Strainers, and devices in HOT ONLY piping.
 - 4. Supply duct liner in ducts serving kitchen and range hood make-up air.
 - 5. Return air ductwork fully exposed in a fully conditioned space, return air plenums not included.
- C. Provide semi-circular protection saddles of #16-gage galvanized steel, 12" long, for insulated piping where hangers occur. On pipe sizes 2" and over, provide 12" length of foam-glass insulation at hangers.
- D. Insulation facings shall be acceptable to NFPA Standards 90A and 90B and ASTM C1136.
- E. All exposed ends of pipe insulation shall be pointed up neatly with appropriate insulating cement, or use premolded PVC end caps on cold only piping and preformed aluminum end caps on dual-temp, hot or steam piping.
- F. Piping systems shall be tested and cleaned before insulation is applied.

3.02 POLYISOCYANURATE INSULATION

- A. All insulation shall be tightly butted and free of voids and gaps. Vapor Retarder shall be continuous. All fasteners and bands shall be neatly aligned and overall work must be of high quality appearance and workmanship. Systems, staples, rivets, screws and other fasteners capable of penetrating the vapor retarder shall not be used.
- B. Install pre-fabricated insulation fittings on elbows, tees, and valves. Insulation at fittings shall be the same type and thickness as on straight pipe sections.
- C. Lap joint of vapor retarder to be sealed using SSL tape, Saran 520 Tape. Vapor retarder butt joints shall be covered with Saran Vapor Retarder Tape. Vapor retarder butt joints shall be covered with a single layer of Saran 520 Tape. Elbows and fittings shall be wrapped with Saran 520 Vapor Retarder Tape in a spiral fashion. Use a minimum amount of overlap between successive courses of spiral wrapped Saran 520 Tape.

- D. When Saran vapor retarder film and tape are used, and when the pipe size is 4" in diameter or greater, a 1"-wide or greater Saran 520 tape with a 25% (1-1/4 wraps) circumferential overlap shall be wrapped around the outside of the Saran vapor retarder on 18" centers.

3.03 FIBER GLASS FOR HOT PIPING

- A. Apply insulation to pipe with side and end joints butted tightly. Seal self-sealing jacket laps and butt joint strips with nylon sealing tool. Fittings shall be finished as specified under "COLD PIPING." Cover fitting with preformed PVC covering.

3.04 FIBER GLASS DUCT WRAP TYPE INSULATION

- A. To be used on round or oval duct or only on rectangular duct with a maximum dimension less than 30."

Adhere insulation to duct surface with approved adhesive applied in strips approximately 4" wide on approximate 8" centers. In addition, secure insulation to the bottom and/or sides of rectangular duct work with a dimension of 24" and above with mechanical fasteners at not more than 18" on center. Butt circumferential edges of insulation and seal joints with staples at 6" o.c., adhering the flange over each joint, and seam for lap of longitudinal joints. Tape all joints and punctures with 3" wide foil reinforced Kraft tape.

3.05 FIBER GLASS DUCT BOARD TYPE INSULATION

- A. Impale with speed washers the insulation over welded pins, spaced a minimum of two rows per side at a maximum of 16" o.c. Seal all breaks, punctures, and joints by adhering a 3" wide strip of foil reinforced Kraft tape.

3.06 ARMAFLEX PIPE INSULATION

- A. Apply in accordance with latest edition of Armstrong's "INSTALLATION INSTRUCTIONS TO THE CONTRACTOR." Apply two coats of Armstrong's WB Vinyl Finish with color selected by NAFI.

3.07 SHEET ARMAFLEX

- A. Apply in accordance with latest edition of Armstrong's "INSTALLATION INSTRUCTIONS TO THE CONTRACTOR." Apply two coats of Armstrong's WB Vinyl Finish with color selected by NAFI.

3.08 PIPE INSULATION EXPOSED TO WEATHER

- A. Provide aluminum jacket 0.016" thick and smooth. Provide side and end laps of 2" minimum with cut edge of side lap turned under 1" for smooth edge. Seal laps with weatherproof sealant. Position laps to shed water. Secure jacket in place with bands 1/2" x 0.015" thick placed on 9" centers. Extend exterior insulation and jacketing 2" beyond sleeve inside building.

3.09 DUCTWORK EXPOSED TO WEATHER

- A. Provide aluminum jacket 0.016" thick around top, sides, and bottom and make smooth. Provide side and end laps of 2" minimum with cut edge of side lap turned under 1" for smooth edge. Seal laps with weatherproof sealant. Position laps to shed water. Secure jacket in place with bands 1/2" x 0.015" thick placed on 9" centers. Extend exterior insulation and jacketing 2" minimum beyond sleeve inside building.

END OF SECTION 15250

SECTION 15270C – HVAC TESTING, BALANCING, AND ADJUSTING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Air Balance: A complete air balance of this project will be required as specified in sections herein. (THIS INCLUDES THE KITCHEN RANGE HOOD).
 - 2. Verifying Functioning of Controls: Check controls and verify that the controls and sequences are performing as specified.

1.02 QUALITY ASSURANCE

- A. The testing, balancing, and adjusting subcontractor shall be independent of any Contractor performing work on this project since one of his primary functions will be to verify the Contractor's performance as a third party professional representative.
- B. The agency shall be active in the field of Testing and Balancing of Heating, Ventilating, and Air Conditioning Systems and shall have successfully completed at least five projects of similar size and scope in which they have performed both a Temperature and an Energy Balance. The agency shall be AABC or NEBB certified.

1.03 OMISSIONS OF MATERIALS AND EQUIPMENT

- A. All abnormal conditions shall be corrected and/or explained in the report. The TBA Contractor shall not be required to correct Contractor errors and/or omissions. It shall be the responsibility of the Testing Agency to notify the NAFI and Contractor of problems found and work with them toward finding a satisfactory solution.

1.04 SUBMITTALS

- A. The contractor shall submit, within 45 days after Notice to Proceed, six copies of submittal data on the qualifications of the Testing Company to which he has awarded the subcontract.
- B. Mechanical Contractor shall furnish to the Testing Agency one copy of approved submittal on all HVAC equipment and one set of HVAC plans and specifications immediately upon the Mechanical Contractor's receipt of notice to proceed with the Mechanical work.

1.05 APPROVAL

- A. No work shall be performed until the NAFI has "APPROVED" the qualification submittal of the Testing Agency.

1.06 WARRANTY

- A. The Test and Balance Agency shall include an extended warranty of one year after submission of report during which time the NAFI may request a recheck or resetting of any item included in the report. Should the NAFI find that the system has not been properly and completely balanced, the warranty period will be extended until the NAFI is satisfied that the system is balanced.

1.07 REPORT

- A. The certified report shall include the following information:
 - 1. Complete testing and balancing data.

1.08 ACCEPTANCE

- A. The NAFI will not accept the building until the system has been properly started up, balanced, and is operating as per the design.

PART 2 – EQUIPMENT

2.01 INSTRUMENTS

- A. The Testing Agent shall own all the instruments, gages, thermometers, etc. necessary to properly do the work. These instruments shall include the following:
 - 1. Tachometer, Stroboscope, Pyrometer, Ammeter, Manometer, Anemometer, Magnehelic gages, Psychrometer, Orsat, and Velometer.

2.02 CALIBRATION

- A. All instruments shall have been recalibrated within 180 days of the performance of work. Certificates verifying the performance of calibration work shall be submitted to this NAFI with the final report.

PART 3 – EXECUTION

3.01 TEST AND BALANCE SYSTEM

- A. The Air Balance Agency shall perform the following tests and balance system in accordance with the following requirements:
 - 1. Test and adjust blower RPM to design requirements.
 - 2. Test and adjust system for design recirculated air, cfm.
 - 3. Test and adjust system for design cfm outside air.
 - 4. Test and adjust system for design cfm exhaust air.
 - 5. Adjust all zones to proper design cfm, supply, return, and exhaust.
 - 6. Test and adjust each diffuser, grille and register to within $\pm 5\%$ of design requirements).

7. Each grille, diffuser, and register shall be identified as to location and area.
8. Size, type and manufacturer of diffusers, grilles, registers and tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations.
9. Readings and tests of diffusers, grilles, and registers shall include required fpm velocity and test resultant velocity, required cfm and test resultant cfm after adjustments. All diffusers, grilles, and registers shall be adjusted to minimize drafts.
10. The Contractor shall make any replacements of the pulleys, belts, and dampers or the addition of dampers required for correct balance as recommended by Air Balance Agency, at no additional cost to the NAFI.
11. Test and adjust the kitchen range hood(s) and other hoods to verify that the specified air quantities are being provided.

3.02 PROCEDURE - CONCLUSIONS AND RECOMMENDATIONS

- A. After the above is completed, forward to the NAFI a report of all tests performed.

END OF SECTION 15270C

SECTION 15310 – NATURAL GAS

PART 1 - GENERAL

1.01 SUMMARY

- A. This system shall consist of all gas piping as indicated on the drawings and to a point 5'-0" outside building indicated including distribution and connection to every gas appliance furnished, installed or connected under this contract.

1.02 QUALITY ASSURANCE

- A. All work to comply with the requirements of the gas utility company, local codes, NFPA Pamphlet No. 54 and Other Sections of these Specifications.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Pipe shall be Schedule 40 Black steel conforming to ASTM A53, assembled with malleable iron (ANSI/ASME 816.3) or formed steel welding fittings. Use welding fittings on 2" and above, on all buried piping, and on all piping from gas meter to gas pressure regulators (on piping systems above standard pressure). Welding shall conform to ANSI/AWS D1.1.
- B. Pipe below grade shall be coated and wrapped. Straight lengths shall be furnished with factory-applied electrically insulating coating. Fittings and damaged coating shall be wrapped with tapecoat CT applied in accordance with manufacturer's latest printed instructions. Provide insulating fillings (above grade) at each end of pipe run.
- C. Underground piping shall have cathodic protection as designed and signed off on by a corrosion engineer or a corrosion control specialist. The installation of the cathodic protection system shall be by a NACE (National Association of Corrosion Engineers) certified technician. Submit installation details with sign-off.
- D. If approved by the local gas utility, pipe below grade shall be Driscopipe 6500 or as approved polyethylene type, installed to conform to manufacturer's recommendations and local utility requirements.
- E. Gas pressure regulators, where indicated, shall be internally vented type. Vent to the outside when applicable. Do not install above ceilings.

PART 3 – EXECUTION

3.01 COORDINATION

- A. The contractor shall coordinate the installation of the gas service with the local gas utility. The gas service will be paid for by the NAFI.

3.02 INTERNAL PIPING

- A. Provide gas cock and dirt leg at each appliance and where indicated on drawings. Provide dielectric flanges at dissimilar metal connections and where indicated on drawings.
- B. Valves shall not be installed above ceilings.

3.03 TEST

- A. After completion of work, and before backfilling, if required, the entire system shall be tested to an air pressure of 125 PSI for a period of two hours and proved tight by inspection. Furnish results of the tests, signed by the Contractor, to the NAFI.

END OF SECTION 15310

SECTION 15410 – DOMESTIC WATER

PART 1 – GENERAL

1.01 SCOPE

- A. Section Includes:
 - 1. The domestic water system shall consist of all hot and cold water piping required for each fixture or equipment item, needing same, installed or connected under this contract from a point 5'-0" outside of the building unless otherwise indicated.
 - 2. Provide heat tracing where indicated.
- B. Related Sections:
 - 1. See Other Sections for basic pipe and pipe fitting requirements, valves, pipe specialties, hangers, insulation, etc.

1.02 QUALITY ASSURANCE

- A. This system shall be installed in accordance with State and Local Codes, as well as these Specifications and the Drawings.
- B. Solder and flux shall not contain more than 0.2% lead. Pipes and fittings shall not contain more than 8% lead.
- C. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 61 or the health effects portion of NSF Standard 14.

PART 2 – PRODUCTS

2.01 PIPE

- A. Above Ground: Type L Copper, hard-drawn and conforming to ASTM B-88, with wrought copper fittings conforming to ASA B16.22 or cast bronze conforming to ASA B16.18.
- B. Under Ground (below floor slab and within building): Type K Copper, hard- or soft-drawn. All piping 2" and smaller shall be looped with soft copper with no joints beneath slab. All piping larger than 2" shall have SIL-FOS brazed joints and wrought copper fittings.
- C. Water lines 3" and larger outside of building or permanent structures and as indicated shall be AWWA C900 Class 150 PVC and Class 150 PVC bell end with gasket and spigot end. The piping shall be Iron Pipe Size (IPS) and shall comply with ASTM D-1785 and ASTM D-2466 for PVC fittings.
- D. Water lines 2-1/2" and under outside of building or permanent structure shall be PVC pipe Schedule 40 complying with ASTM D 1785 and ASTM D2466 for PVC fittings. Solvent welding joints shall comply with ASTM D 2564. All materials shall bear National Sanitation Foundation (NSF) seal on pipe and cement container.

2.02 PIPE HEAT TRACING

- A. Furnish a complete UL Listed System of pipe heating cable for freeze prevention complete with components, installation accessories, thermostats, and controls installed in strict accordance with Article 427 of the National Electric Code.
- B. The heating cable shall consist of two (2) 16 AGW Nickel-coated-copper bus wires embedded in a radiation-crosslinked polymer capable of regulating its power output in response to temperature changes all along its length with a self-regulating index of no less than 90% between 50° and 140°F. The heating cable shall be covered with a radiation-crosslinked modified polyolefin dielectric jacket (2,000 PSI Minimum) which in turn shall be covered with a tinned copper braid (3.0 Ohms/1,000' Maximum electrical resistance) and an outer modified polyolefin jacket. Voltage ratings shall be 120, 208, 220, 240, or 277. See Electrical Drawings for requirements.
- C. INSTALLATION
 - 1. The heating cable shall be installed under the pipe's thermal insulation without spiraling and with sufficient heat output to maintain the pipe temperature of no less than 40°F when outside ambient is -20°F and the average wind speed is 15 MPH.
 - 2. When used on non-conductive pipe, the heater shall be attached to the pipe with a solid aluminum tape.
 - 3. All power, splice, and tee connections must be made up using reusable, NEMA 4X, 6P, quick-connect components, requiring no stripping of the core insulator. No heat shrink components will be allowed in making these connections.
 - 4. After cable installation and before and after installation of THERMAL pipe insulation, the heating cable shall be tested using a 2,500-volt megger. Minimum ELECTRICAL insulation resistance shall be 20 megohms regardless of circuit length. Both bus wires and braid shall be tested to verify the connection of all splices and tees. A copy of the meggering report shall be supplied to the engineer. All material shall be installed in accordance with the manufacturer's recommendations.
- D. Quality Control: Subject to requirements, furnish heat tracing as manufactured by Raychem XL-Trace as distributed by INDUSTRIAL HEATER, 8400 Wolf Lake Drive, Suite 116, Bartlett, Tennessee, 38133.

2.03 REDUCED PRESSURE BACKFLOW PREVENTERS:

- A. Backflow preventers shall be reduced pressure principle type ANSI/ASSE 1013 with stainless steel springs, reversible seat disc, two independently operating spring loaded check valves, non-threaded vent outlet, air gap fitting, entering side strainer and four test cocks. ¾-inch through 2-inch backflow preventers shall have bronze body, bronze, plastic internal parts and full port ball valves. 2-½-inch through 10-inch backflow preventers shall have ductile iron body, stainless steel internal parts and non-rising gate valves and shall be FDA approved.
- B. Backflow assemblies shall be tested and certified under the following standards.

1. ASSE No. 1013
 2. AWWA C511-89
 3. CSA B64.4.
 4. FCCCHR of USC Manual Section 10.
- C. Backflow assemblies shall be listed by the following standards.
1. IAPMO (UPC)
 2. SBCCI (Standard Plumbing Code)
- D. Furnish and install an additional valve on the inlet side of the strainer of each backflow preventer.
- E. Furnish and install backflow preventer with equivalent attributes to those scheduled on the drawing.

2.04 PRESSURE REDUCING VALVES:

- A. Pressure reducing valves 1-inch and smaller shall be Watts Regulator series 25AUB-DU-GG or approved equal with bronze bodies, renewable stainless steel seat, thermoplastic internal parts, reinforced diaphragm, stainless steel integral strainer, pressure gauge and threaded double union ends.
- B. Pressure reducing valves 1¼-inch and larger shall be equal to Watts Regulator series 115-7 with bronze strainer, cast iron bodies, renewable stainless steel seat, bronze internal parts, rubber disc, equalizer line and flanged ends.
- C. Provide pressure reducing valves in water service entrance when required to limit building water pressure to 70 PSI maximum. Install PRV on house side of the reduced pressure backflow preventer. Provide a pressure gauge on the house side of each PRV.

2.05 WATER HAMMER ARRESTORS

- A. Water Hammer Arrestors shall be Wade Shokstops of all stainless steel construction with welded nested bellows or equivalent.

PART 3 – EXECUTION

3.01 GENERAL

- A. Provide service ball valves in the hot and cold water at each fixture group, major equipment, and water heaters.
- B. Disinfect potable water piping by filling with a solution containing 50 parts per million of available chlorine or as required by the local Utility. This solution shall be allowed to stand six hours. Flush all piping and equipment thoroughly.
- C. Water Hammer Arrestors shall be sized and located in accordance with Plumbing and Drainage Institute Standard PDI-WH201 and as shown on plans

- D. Test water system with water to a pressure of 125 PSI for a period of two hours. Prove tight by maintaining pressure without adding water. Results of the tests, signed by the Contractor, shall be furnished to the NAFI.
- E. All water heaters and storage tanks shall have properly sized temperature and pressure relief valves, piped to within 6" of floor, and shall be set in drain pans with sight drains per building code.
- F. Avoid installing piping in outside walls; when unavoidable, insulate the pipe, and install the piping between the wall insulation and the inside finished surface.
- G. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products, or other aggressive chemical agents not compatible with PVC compounds. Systems shall be hydrostatically tested after installation. Testing with compressed air gas is not approved.

3.02 INSPECTION OF SITE:

- A. Visit the proposed construction site and investigate all existing utilities, and working conditions to be encountered prior to bidding.

END OF SECTION 15410

SECTION 15420 – SOIL AND WASTE

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. The soil and waste system shall consist of all sanitary waste and vent piping required for each fixture, drain or equipment installed or connected under this contract from a point 5'-0" outside of the building unless otherwise indicated.
- B. Related Sections:
 - 1. See other sections of these specifications for exterior sewer system.
 - 2. See other Sections for basic piping requirements, specialties, hangers, seismic bracing, etc.
 - 3. See section 15410 for Heat Tracing.

1.02 QUALITY ASSURANCE

- A. This system shall be installed in accordance with State and Local Codes, these Specifications and the Drawings. Contractor shall call to the attention of the NAFI any changes required by codes that will change the design of the building.

PART 2 – PRODUCTS

2.01 SANITARY WASTE AND VENT, AIR CONDITIONING UNIT CONDENSATE DRAINS, REFRIGERATOR AND FREEZER CONDENSATE DRAINS

- A. ABOVE GRADE (*Latest Issue of Each Standard Shall Apply)
 - 1. 2" and larger: All waste, vent, and sewer lines shall be of cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301*, ASTM A 888*, or ASTM A 74* for all pipe and fittings. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer.
 - 2. 1-1/2" and 1-1/4": Galvanized steel conforming to ASTM A120*, with screwed CI drainage fittings conforming to ASA B16.12 or DWV copper wrought copper drainage fittings.
- B. BELOW GRADE (*Latest Issue of Each Standard Shall Apply)
 - 1. 2" and larger: All waste, vent, and sewer lines shall be of cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301*, ASTM A 888*, or ASTM A74* for all pipe and fittings. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer.
 - 2. 1-1/2" and 1-1/4": Type "L" copper with wrought copper drainage fittings.
- C. JOINTS: (*Latest Issue of Each Standard Shall Apply)

Joints above grade for hubless pipe and fittings shall conform to the manufacturer's installation instructions, the CISPI Standard 310* and local code requirements. Hubless coupling gaskets shall conform to ASTM Standard C 564*.

Joints above or below grade for hub and spigot pipe shall be installed with compression gaskets conforming to the requirements of ASTM Standard C 564* or shall be installed with lead and oakum.

- D. PVC-DWV may be used where allowed by code and when pipe is not located in ceiling return plenums. PVC shall not be used where service temperature is 140°F and higher (kitchens, laundries, etc.). Assemble with solvent weld joints.
- E. Plumbing vent roof flashing shall be 4lb. sheet lead.

2.02 CORROSIVE WASTE DRAINAGE SYSTEM

- A. Special drainage systems for corrosive chemical or acid waste shall be manufactured from CPVC Type IV, ASTM Cell Classification 23447. All pipe shall be Schedule 40 CPVC manufactured to dimensional requirements of ASTM F441. All pipe shall be CAN/ULC S102.2 listed for all flame spread and smoke development with rating designated on the pipe marking. All pipe markings shall be accompanied by a yellow stripe for identification of CPVC chemical waste system. All fittings shall be CPVC drainage patterns meeting the requirements of ASTM D3311 and specialty patterns according to the manufacturer's specifications. All fitting socket dimensions shall be in accordance with approved manufacturers' specifications. All fittings shall be CAN/ULC S102.2 listed for flame spread and smoke development and rating designated on the original package labeling. Joining method for pipe and fittings shall be solvent cement welding. Solvent cement shall be a "one-step" primerless type CPVC cement designated by the system manufacturer, specially formulated for resistance to corrosive chemicals and manufactured in accordance with ASTM F493. All pipe, fittings, and cement shall be supplied together as a system, as Spears LabWaste CPVC Corrosive Waste Drainage Systems manufactured by Spears Manufacturing Company or as approved.

2.03 CLEANOUTS:

- A. Where installed in exposed cast iron pipe, cleanouts shall consist of raised-head cast brass plug with caulking ferrule. Where installed in tapped drainage fittings, cleanouts shall be cast brass raised-head plug.
- B. Cleanouts in walls shall consist of raised solid head, cast brass plug with stainless steel cover.
- C. Where installed in floors, cleanouts shall consist of cast iron ferrule, brass plug, adjustable cast iron housing and nickel brass scoriated cover and matching flange for flush mounting. Cleanouts in tile floor shall have recessed cover.

- D. For installation in exterior piping, cleanouts flush with finish grade shall consist of cast iron adjustable head, seriated cutoff ferrule, brass raised head internal plug, heavy scoriated cover.
- D. Cleanouts are not allowed above ceiling if space is used as an air plenum.
- E. Provide access doors in inaccessible ceilings, walls and chases where required. See Section 15100.

2.04 MANHOLES:

- A. Manholes shall be constructed in accordance with the details as shown on the drawings. All manholes shall have concrete bottoms. Manholes may be constructed of radial or common brick. Walls shall be 3-inches thick for manholes 0 to 10 feet deep and 12-inches thick for manholes deeper than 10 feet. The manholes shall be plastered with $\frac{3}{4}$ -inch Portland Cement mortar on both interior and exterior side.
- B. Manhole rings and covers shall be firmly embedded on the masonry and carefully leveled and placed so as to conform to adjacent finished grade unless otherwise indicated. Manhole steps shall be provided and installed as the manhole walls are built.
- C. All sanitary manholes shall have the words "Sewer" cast in top. All storm manholes shall have the words "Drain" cast in top.
- D. Manholes steps shall be of Gray or Ductile iron construction 10-inches wide and 10-inches long including a 5-inch projection from the wall. Manhole steps shall be Neenah No. R-1980-E or approved equal. Manhole frames and covers shall be suitable for medium to heavy-duty traffic as applicable.
- E. Where it is necessary to connect to an existing manhole an opening shall be cut in the wall of the existing manhole of sufficient size to permit proper installation of the new pipe at the desired location and grade. The new pipe shall extend entirely through the wall of the manhole and the opening filled with concrete or with brick and concrete and plastered with mortar so that no leakage will occur. All loose or broken plaster shall be repaired.
- F. Precast manholes may be submitted for approval.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Cleanouts shall be located as required by the International Building Code and as indicated on the Drawings. Cleanouts shall occur at intervals of not more than 75- 0" or as indicated. Cleanouts shall be brought to an accessible location, flush with grade or floor, and terminated with fitting equal to that specified elsewhere.

- B. Single or double sanitary tees or quarter bends may be used only where the change is from horizontal to vertical, and only above slab.
- C. Condensate drains for air conditioning units shall include traps sufficiently deep to seal air flow. Drain lines less than 2" in size shall have cleanouts on minimum 20'- 0" centers and in each change in direction of flow. Otherwise, provide cleanouts per code.
- D. Before commencing any work, verify invert elevations required for drainage systems to insure that they can be connected to new and existing drainage services with required slope and cover.

3.02 TESTING

- A. Entire waste and vent system shall be tested to a minimum head of 10'-0" hydrostatic head. This pressure shall be maintained a minimum of three hours and proved tight. Results of the test, signed by the Contractor, shall be furnished to NAFI.

END OF SECTION 15420

SECTION 15450 – PLUMBING FIXTURES

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Furnish and install all fixtures shown on the plans or specified herein.
 - 2. Provide all necessary support, trim and accessories required.

1.02 SUBMITTALS

- A. All items furnished under this section shall be submitted for approval.

1.03 QUALITY ASSURANCE

- A. All fixtures shall be roughed-in in accordance with applicable codes and per manufacturer's instructions. All fixtures shall have stops on water supply connections.
- B. No ferrous piping will be allowed in fixture supply connections.
- C. Fixtures shall be installed as recommended by manufacturer and as indicated on the drawings.
- D. All faucets shall be equipped with a laminar flow control device with pressure compensation from 40-120 psig.
- E. Faucets and all other components of the domestic water system shall be National Sanitation Foundation (NSF) 61 compliant.

PART 2 – PRODUCTS

2.01 FIXTURES

- A. Fixtures shall be nonabsorbent throughout and free from waves, kiln marks or discoloration.
- B. All surfaces coming in contact with walls, floors or other flat surfaces shall be flat.
- C. All enameled iron ware shall be acid-resisting.
- D. All fixtures shall be punched for trim specified.
- E. Fixtures shall be equal to those scheduled on the drawings.

2.02 TRIM

- A. All exposed finished metal parts shall be chromium-plated; except, rough-bodied parts shall be nickel-plated.

- B. All supplies shall be IPS brass; except where otherwise specified.
- C. All fixtures will be provided with some form of supply stop.
- D. Traps for lavatories and sinks shall be chrome-plated cast brass P-traps with clean-out.
- E. Provide cast brass, chrome-plated, set screw type, escutcheons on supply and waste piping.

2.03 SUPPORTS

- A. Chair carriers where specified shall be as manufactured by Wade, or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All wall-hung plumbing fixtures with lip extending more than 15" from wall shall be supported on chair carriers.
- B. Unless specifically specified to be furnished with chair carrier, wall-hung lavatories, sinks, etc. shall be secured to wall with back-up plate and threaded rods. This Contractor shall furnish and install all backing, blocking, reinforcing, hangers, bolts, anchors and brackets required.
- C. Fixtures mounted on uneven surfaces shall be bedded in an approved manner.
- D. All hot and cold water supplies to plumbing fixtures or to showerheads shall have a drop-ear fitting secured to prevent movement.
- E. See Architectural drawings for exact locations of fixtures.

3.02 PROTECTION AND CLEANING

- A. All fixtures subject to damage prior to completion of building shall be protected in an approved manner. Job must be turned over to NAFI with all fixtures clean and free from damage.

END OF SECTION 15450

SECTION 15530 – HVAC CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Provide all temperature controls in accordance with recommendations of the equipment manufacturers and with the drawings and specifications.
 - 2. Controls shall be low voltage electric or electronic.
 - 3. Provide all wiring, starters, disconnects, devices, relays, etc. for a complete and operating system. If starters and/or disconnects are provided by the electrical division, it is the responsibility of the mechanical sub-contractor to coordinate control wiring and interlocks (for mechanical equipment) between the electrical and mechanical divisions.
 - 4. All HVAC Control Wiring shall be by HVAC division including 120 VAC power for all control panels, control transformers, relays, etc. Wiring shall be in accordance with NEC.

1.02 SUBMITTALS

- A. Submit cut sheets on all devices and complete wiring diagrams.
- B. Provide control drawings framed under glass in equipment room or in a wall mounted cabinet with lock.

PART 2 – MATERIALS

2.01 COMPONENTS

- A. General: Unless otherwise indicated, provide manufacturer's standard components as indicated in published data.

2.02 ELECTRONIC THERMOSTATS:

- A. Electronic thermostat and subbase shall be Automated Logic with two programmable energy savings periods every 24 hours. Seven-day offset program. Skip and change program keys. Digital clock indicates time-of-day, offset times, skip and offset symbols. Subbase shall include auto changeover, and continuous or intermittent fan operation. Thermostats shall be system powered, with battery back-up.

2.03 THERMOSTAT GUARDS

- A. Thermostat guards shall be Automated Logic clear plastic cover with clear mounting base. Guard shall allow adequate air circulation for proper operation of thermostat and have tumbler lock. Key multiple guards alike. Guards shall be steel type where indicated.

2.04 RELAYS

- A. Switching relays shall be enclosed unless intended to be mounted in a larger electrical enclosure. Relay contact rating shall be adequate for load.

2.05 TRANSFORMERS

- A. Transformers shall be mounted in an electrical enclosure and of adequate VA capacity for load.

2.06 SMOKE DETECTORS/FIRESTATS

- A. Smoke detectors and firestats shall be UL listed and shall be furnished by Div. 16 and installed by Division 15. Smoke detectors and firestats shall shut down its respective unit if excessive temperatures or smoke is detected. Smoke detectors shall also cause a visual and audible alarm as required by NFPA 90A.
 - 1. Furnish control components as required by control sequences specified.

PART 3 – INSTALLATION

3.01 INSTALLATION

- A. Install controls and materials in accordance with manufacturer's instructions, rough-in drawings, plans and specifications.
- B. Wiring shall be done in accordance with NEC and Division 16 of these specifications.
- C. All wire shall be in conduit and devices mounted on appropriate electrical boxes.
- D. All wire shall be color coded in accordance with industry standards. Use number code on wire if required to avoid confusion.
- E. Set heat anticipators properly, where applicable.
- F. Instruct NAFI's personnel in operation of control system.
- G. Where controls are accessible for adjustment by building occupants, mount controls 48" above finished floor.

PART 4 – CONTROL SEQUENCES

4.01 GENERAL

- A. See equipment notes on drawings.

END OF SECTION 15530B

SECTION 15600 – HVAC EQUIPMENT**PART 1 – GENERAL****1.01 SUMMARY**

- A. Furnish and install all required equipment, appurtenances, combination starter-disconnects, motor starters, and accessories for a complete heating and/or cooling system. All equipment furnished for this project shall comply with applicable requirements of ASHRAE Standard 90.1 and ASHRAE Standard 62 latest issues. Disconnects and starter enclosures shall carry NEMA Class and Group as required by the application.
- B. See other sections of these specifications that may specify accessories or features.
- C. Refer to the schedules on the drawings where equipment capacities are not included in this section.
- D. Review other sections of the specifications and the plans for services required to each piece of mechanical equipment. Any required accessories, appurtenances, or service omitted from the plans or specifications that is not called to the attention of the NAFI at least 72 hours before bidding and corrected by addendum shall be provided as though shown.
- E. Motors required in connection with equipment shall be of sufficient size and speed for duty to be performed; not exceeding their full-rated load when driven equipment is operated at specified capacity under most severe conditions likely to be encountered. Motors shall also be compatible with variable frequency drives where specified and shall conform to NEMA standards for the application. See ENERGY POLICY ACT below.
- F. Belt drives shall be adjustable "V" Belt Type. Selection shall be based on 150% of the motor horsepower. Selection shall be factory-set so that specified capacity is a midpoint setting, allowing 20% overall speed adjustment. Motors shall be selected on 110% of the brake horsepower required with a service factor of 1. Motors and/or drives shall be changed if required to deliver specified CFM should static pressure differ from that specified due to excessive duct offsets and configuration in the opinion of the engineer.
- G. All exposed rotating machinery shall be equipped with guards.
- H. Submit all equipment for approval.
- I. All refrigeration compressors shall carry manufacturer's standard 5-year warranty.
- J. Make wall and roof penetrations weather tight at mechanical penetrations.

- K. Furnish all starters, combination starter-disconnects, motor controllers or contactors for proper operation of all motors, including specified requirements for interlocks and control sequences. Starters shall be Square D Class 8536 or as approved, equipped with solid-state overloads.
- L. Equipment with water coils or drain pans mounted in attic or above ceilings shall be set in or immediately above drain pans constructed of minimum 24 gauge galvanized steel with joints made water tight, piped to outside or other conspicuous point with open and visible discharge to serve as an alarm that a leak is occurring. An alternate to the sight drain is to provide a float switch in the pan to stop the equipment when standing water occurs in the pan. Pans shall be minimum 1-1/2" deep and minimum 6" larger than equipment including coverage for chilled water valves or as required by code.
- M. Mechanical equipment installed higher than ten (10) feet above the floor including equipment installed above ceilings shall be provided with work platforms on service side(s) of the equipment for maintenance access. Platform shall be accessible by ladder or other means as needed.
- N. Ground mounted equipment shall be bolted down to its concrete pads at a minimum of two points to reduce theft hazard.
- O. Test all equipment to manufacturers standard when tests are required.
- P. Air Filters: Air filters shall be rated in accordance with ASHRAE Standard 52.2-99. Install one clean set of filters at substantial completion to replace the initial set (all filters). Deliver one spare set to NAFI. Do not operate equipment without all filters in place. Provide filters in accordance with the following except where indicated otherwise on the drawings. Filters shall be UL Listed Class 2. The Minimum Efficiency Reporting Values (MERV) shall be as indicated.
 - 1. Package units, 3 thru 25 tons capacity – 2" filters, Farr Aeropleat III, 0.09" SPWG resistance at 250 FPM, MERV 7.
- Q. Access Doors: See SECTION 15100 for requirements.
- R. Unless otherwise specified below, all air conditioning equipment shall comply with the following standards as a minimum:
 - 1. ANSI/ASHRAE 15 (Safety Code for Mechanical Refrigeration)
 - 2. ASHRAE Handbook (HVAC Systems and Equipment)
 - 3. NFPA 90A (Installation of Air Conditioning and Ventilating Systems)
 - 4. NFPA 90B (Installation of Warm Air Heating and Air Conditioning Systems)

1.02 INDOOR AIR QUALITY PROVISIONS

- A. Equipment provided shall comply with requirements set forth in ASHRAE Standard 62-2011.
- B. Evaporator coil drain pans shall be self-draining to prevent standing water.

- C. All HVAC equipment that handles moving air shall have provisions for easy accessibility for in-situ cleaning and inspection of all moving parts and interior areas. "Easy Accessibility" includes hinged access panels when available as options and other approved reasonable and convenient means of access.
- D. Maintain minimum ten (10) foot separation between exhaust terminations and OA intakes, windows and doors.

PART 2 – PRODUCTS

2.01 PRODUCTS SHALL BE AS SHOWN ON THE DRAWINGS.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. The Contractor, prior to installing any equipment, shall examine the conditions under which the equipment is to be installed, and shall notify the NAFI of conditions detrimental to the proper installation of the equipment.
- B. Install all equipment in accordance with the manufacturer's latest written instructions, including clearances, and in accordance with governing codes and recognized industry standards and practices to insure that the equipment serves the intended function.
- C. Coordinate all work with other trades as necessary for proper interfacing.
- D. All equipment shall be protected from any form of damage. Any damaged equipment shall be replaced without additional cost to the NAFI.

3.02 START-UP

- A. All major equipment and systems shall be started by a factory trained service mechanic, or a UA-MCA Certified Technician that is experienced in the service and operation of that piece of equipment. Major equipment includes roof top air conditioning units, condensing units, energy recovery units, packaged ventilating units, make-up air units, and controls. The Mechanical Contractor shall start-up and place into operation all auxiliary equipment such as exhaust fans, etc.
- B. The factory trained service mechanic shall be accompanied by the Test and Balance Agency. The Agency shall verify the unit performance and shall prepare his report accordingly.

3.03 CONDENSATE DRAIN TRAPS

- A. Provide trapped condensate drains at all evaporators with depth as detailed and as recommended by equipment manufacturer. 1-¼ inch and larger traps shall be constructed of tees with plugs for cleanouts. Coordinate with PLUMBING CONTRACTOR.

END OF SECTION 15600

SECTION 15800 – HVAC SHEET METAL

PART 1 – GENERAL

1.01 SCOPE

- A. All low pressure duct work (1" SPWG Class Construction or as indicated on the drawings) including supply, return, exhaust, and outside air ductwork, and other special ducting, flues, vents, or chimneys to complete the systems as shown on the drawings or specified herein.

1.02 DEFINITIONS

- A. Diffusers: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.
- B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling or floor.
- C. Register: A combination grille and damper assembly over an air opening.

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Air distribution devices and accessories, including louvers.
 - 2. Smoke and Fire dampers and doors.
 - 3. Flexible duct.
 - 4. Flexible connections.
 - 5. Damper hardware.
 - 6. Multi-blade dampers.
 - 7. Access doors.
 - 8. Turning vanes.
 - 9. Special ducting, flues, vents, chimneys, dishwasher and grease ducts.
 - 10. Duct Liner.
 - 11. Range hood installation shop drawings.
 - 12. And other specified equipment.
- B. Product Data: For each model indicated, include the following:
 - 1. Data Sheet: For each type of air outlet and inlet, and accessory furnished: indicate construction, finish, and mounting details.
 - 2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
 - 3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
 - 4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

- C. Coordination Drawings: Provide reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other work installed in ceilings and walls and submit for approval. See Section 15000, Par. 1.04 for other requirements.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for diffusers, registers, grilles, and louvers with factory-applied color finishes when requested.
- E. Samples for Verification: Of Diffusers, registers, grilles, and louvers in manufacturer's standard sizes, showing the full range of colors when requested. Prepare Samples from the same material to be used for the work.

1.04 REFERENCES

- A. ASHRAE – Handbook 2001 Fundamentals; Chapter 35 – Duct Design.
- B. ASHRAE – Handbook 2000 HVAC Systems and Equipment; Chapter 16 – Duct Construction.
- C. ASTM A 90 – Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- D. ASTM A 167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- E. ASTM A 525 – General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- F. ASTM A 527 – Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
- G. NFPA 90A – Installation of Air Conditioning and Ventilating Systems.
- H. NFPA 91 Exhaust Systems
- I. NFPA 92A and 92B – Smoke Control and Smoke Management
- J. NFPA 96 – Commercial Cooking Operations.
- K. SMACNA – HVAC Duct Construction Standards
- L. UL 181 – Factory-Made Air Ducts and Connectors.
- M. NAIMA (North American Insulation Manufacturers Association) Air Duct Cleaning.
- N. NADCA (National Air Duct Cleaner Association) – Air Duct Cleaning.

1.05 GOVERNING PUBLICATIONS AND AUTHORITIES

- A. ASHRAE Handbooks.
- B. SMACNA Standards.
- C. Underwriters Laboratories, Inc.
- D. NFPA Pamphlets
- E. NAIMA
- F. NADCA

PART 2 – PRODUCTS

2.01 MATERIALS

- A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.
- B. Steel Ducts: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz per sq.ft. for each side in conformance with ASTM A90.
- C. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.
- D. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.02 LOW PRESSURE DUCT WORK

- A. Fabricate and support in accordance with SMACNA Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
- D. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.
- E. Use double nuts and lock washers on threaded rod supports. See vibration isolation and seismic restraint requirements.

2.03 FLEXIBLE CONNECTIONS

- A. Flexible connections shall be made from "VENTGLAS", Neoprene coated glass fabric.

2.04 DAMPER HARDWARE

- A. Dampers on exposed duct with shaft length of 12" or less shall be equipped with "VENTLOCK" #620 1/4" dial regulator, or equal; with shaft length of 12" to 20" with "VENTLOCK" #653 3/8" dial regulators and 607 end bearings.
- B. Larger dampers shall be controlled with "VENTLOCK" self-locking regulators #640 or #641 in 3/8" or 1/2" size, or equal and shall be installed with #607 end bearings.
- C. Damper operators on inaccessible finished ceilings shall be equipped with "VENTLOCK" #688, or equal flush mounting concealed damper regulators.
- D. Equivalent damper hardware by Young Regulator is acceptable.

2.05 ACCESS DOORS

- A. Provide access doors for adequate accessibility to dampers and other devices concealed within ducts, walls, inaccessible ceilings and floors. All duct access doors shall be double panel construction with rigid insulation between the panels. See section 15100 for other requirements.

2.06 INSULATED ACOUSTICAL FLEXIBLE DUCT

- A. Provide where indicated on drawings Flexmaster Type 8M, UL 181 Class 1 flexible duct. Duct length shall not exceed sixty (60) inches or as indicated on the drawings. Duct shall not penetrate firewalls and shall not be used within five (5) feet of any unprotected fire wall penetration.
- B. The duct shall be constructed of a CPE fabric supported by helical wound galvanized steel. The fabric shall be mechanically fastened to the steel helix without the use of adhesives.
- C. The internal working pressure rating shall be at least as follows with a bursting pressure of at least 2 1/2 times the working pressure:
 - Positive: 6 inches w.g.
 - Negative: 4 inches w.g.
- D. The duct shall be rated for a velocity of at least 4000 feet per minute.
- E. Suitable for operating temperature range of -20°F to +250°F.
- F. Acoustical performance, when tested by an independent laboratory in accordance with the Air Diffusion Council's Flexible Air Duct Test Code FD 72-R1, Section 3.0, Sound Properties, shall be as follows:

The insertion loss (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" Dia.	7	31	40	38	40	27
8" Dia.	12	29	36	35	38	22
10" Dia.	21	28	29	33	26	12

The radiated noise reduction (dB) of a 10 foot length of straight duct when tested on accordance with ASTM E477 at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" Dia.	5	8	7	8	11	15
8" Dia.	10	7	7	8	10	13
10" Dia.	9	6	6	5	9	13

The self generated sound power level (LW) dB re 10-12 Watt of a 10 foot length of duct for an empty sheet metal duct when tested in accordance with ASTM E477, at a velocity of 1000 feet per minute, shall not exceed:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" Dia.	42	31	23	18	17	21
8" Dia.	41	34	27	19	18	21
10" Dia.	54	45	38	31	27	23

- G. Factory insulate the flexible duct with fiberglass insulation. The R-value shall be at least 4.2 at a mean temperature of 75°F.
- H. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with cross-hatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.

2.07 DUCT LINER

- A. Internal insulation shall be 1" thick flexible fiberglass duct liner conforming to NFPA 90-A, UL 181, and ASTM 1071, 2 pounds per cubic foot minimum density with EPA certified anti-microbial treatment, and with a noise reduction coefficient of 0.70. Material shall be KNAUF Duct Liner EM, or equal. Duct Lining shall be applied in accordance with the latest edition of SMACNA, HVAC Duct Construction, Standard Metal and Flexible manual. When ducts are exposed to outside ambient conditions (attics, boiler rooms, etc.), use 2" thick liner unless the ductwork is also externally insulated.
- B. Secure all insulation continuously to the inside of the ductwork, coated side to air stream, with fire-resistive adhesive as recommended by the insulation

manufacturer. In addition to the adhesive, secure all insulation to all top, side and bottom panels with mechanical fasteners on 16" max. centers, using spot welded-on pins and push-on type clips. Pins shall not compress the insulation more than 1/8 of an inch. Repair all torn, snagged, and damaged places in the insulation coating with fire resistive adhesive before final installation of ductwork. Seal all abutting edges of insulation with fire resistive adhesive. Arrange all insulation to avoid interference with dampers, and provide a sheet metal liner between the insulation and each damper.

- C. Allowance has NOT been made in the duct sizes for the liner. Oversize sheet metal to accommodate insulation total thicknesses.
- D. Insulate first ten feet of ductwork from roof exhaust fan(s), VAV terminals, and as indicated. Also insulate all rectangular low pressure ductwork in equipment rooms. Duct liner shall be 1" thick (2" in boiler rooms and for exterior ductwork) or as indicated.

2.08 AIR DISTRIBUTION DEVICES

- A. GENERAL:
 - 1. All outlet grilles shall have gaskets.
 - 2. Unless otherwise noted, sidewall devices and ceiling devices shall be off-white baked enamel.
 - 3. Furnish opposed blade volume control dampers on supply, return, and exhaust devices, where indicated.
 - 4. Where device is to lay in a tee bar ceiling, verify grid dimensions. Device shall be square with nominal dimension of side same as shorter grid dimension. That is, provide 24" x 24" nominal panel with 24" x 48" grid, etc.
 - 5. Ceiling devices shall be compatible with ceiling construction.
 - 6. Test devices in accordance with ASHRAE 70.

2.09 FIRE AND SMOKE DAMPERS

- A. Fire dampers, radiation dampers, and fire-smoke dampers shall be following RUSKIN model numbers, or equivalent as manufactured by Nailor, Ruskin, Greenheck, or equal.
- B. Fire dampers and fire smoke dampers shall be UL-listed and shall conform to UL 555 or UL 555S latest edition. Dampers shall be dynamic type. Dampers shall be licensed to bear the AMCA Standard label
- C. Dampers for horizontal duct mounting shall be Model D-IBD2 Style B or C (D-IBD2 Style C or CO for medium and high-pressure duct. Seal duct to collars to make airtight.)
- D. Damper for vertical mounting shall be same but with closure springs and latches for vertical ducts.
- E. Smoke dampers shall be Model SD60 with actuators out of the air stream (air foil blades, low leakage, with 115V actuator unless otherwise required by Electrical

or Controls division).

- F. Fire/smoke dampers shall be Model FSD60 with actuators out of the air stream (air foil blades, low leakage, with 115V actuator unless otherwise required by Electrical or Controls division).
- G. Furnish dampers with sleeves and collars that are compatible with wall and duct applications.
- H. Smoke damper and combination fire and smoke damper actuators shall be "controlled closure" type.
- I. Ceiling radiation dampers shall be CFD with thermal insulation blanket. Furnish dampers that are compatible with the ceiling as applicable.

2.10 LOUVERS

- A. Weatherproof louvers shall be by Ruskin model numbers below, or equivalent by Empco, American Warming and Ventilating, or Industrial Louver, and shall bear the AMCA Certified Ratings Seal.
- B. Stationary type shall be Ruskin extruded aluminum, high performance type, drainable model ELF-6375DX, constructed of 0.080" aluminum, 37.5° blades on 5.9" centers, 6" deep frames. Louvers shall have 55 percent free area based on 48" height and water penetration shall not exceed 0.01 oz./sq.ft. per 15 minutes at 1006 FPM thru free area based on a water flow rate of 0.25 gal./min. Pressure drop shall not exceed 0.075 inches SPWG at 700 FPM thru free area. Furnish with bird screen.
- C. Louvers installed in face brick walls shall be furnished without flanges for recessing; otherwise furnish with flanges. Coordinate louvers for receiving walls.
- D. Brick vents shall be model BVC cast aluminum with bird screen. Furnish with dampers when indicated.
- E. Coordinate louver finishes and colors with Architect. Submit samples.

2.11 TURNING VANES

- A. Turning vanes shall be Aerodyne HEP high efficiency type with extended trailing edges. Pressure drop shall not exceed 0.06 inches SPWG at 1500 FPM with vanes on 2.4 inch centers (0.027 inches SPWG @ 1000 FPM, and 0.105 inches SPWG @ 2000 FPM). Submit test data for approval. Turning vanes shall be perforated metal type with internal insulation where duct is internally insulated.

2.12 MULTI-BLADE DAMPERS

- A. Multi-blade dampers shall be by Empco, American Warming & Ventilating, Industrial Louver or Ruskin.
- B. Two-position control dampers may be parallel blade type. Modulating or balancing dampers shall be opposed blade type.

- C. Motorized outside air dampers shall have vinyl or stainless steel blade seals and stainless steel jamb seals.

2.13 RANGE HOOD EXHAUST DUCTS (Field Construction)

- A. Ductwork bearing grease-laden air shall be constructed of and supported by 16 gauge black steel or 18 gauge 304 stainless steel #4 polished finish with continuous external welded liquid tight seams and joints. All exposed ducts shall be stainless steel.
- B. Clearance of not less than 18" shall be maintained between hood or duct and combustible materials.
- C. Exhaust ducts shall be wrapped in high temperature insulation blanket, which provides a two-hour fire rating around duct with "zero clearance" required from the surface of the insulation (See SECTION 15140 for requirements). Installation and material shall conform to NFPA 96 and be UL Listed for this purpose. Install insulation in accordance with manufacturer's recommendations.
- D. Slope horizontal exhaust ducts back to hood at a 2% slope (8.3% where horizontal duct runs exceed 75 feet) with no trapped low points. Exhaust outlets shall be located minimum 10 feet from an adjacent building or intake opening.
- E. Provide access doors to hood damper(s) maximum 18" from damper. Access doors shall be UL listed. Doors shall be accessible without the use of a tool. Label doors "ACCESS PANEL-DO NOT OBSTRUCT".
- F. For large exhaust ducts provide 20" X 20" access doors on maximum 20-foot centers for personnel entry to all portions of duct system and at each change in direction. Where entry is not possible due to size, provide minimum 18" X 12" (larger if space permits) hand access doors on maximum 12-foot centers. Doors shall be accessible without the use of a tool. Access doors shall be UL listed. Label doors "ACCESS PANEL-DO NOT OBSTRUCT."
- G. Installation shall comply with NFPA 96 and SMC 505 (1997) or IMC 2003 whichever is applicable.
- I. The HVAC contractor shall prepare and submit shop drawings for approval by the NAFI and the authorities having jurisdiction for the entire range hood(s) and ductwork installation indicating compliance with all the above requirements.

2.14 TYPE B GAS VENT PIPE AND FITTINGS

- A. The gas vent system shall be engineered and constructed to develop a positive flow adequate to exhaust all flue gases to outside atmosphere, without condensation within the vent or spillage at any appliance draft hood.
- B. All parts of vent system shall be UL listed Metal-Fab Type B double wall gas vent piping, and such piping shall be continuous from the appliance outlets into Metal-Fab vent top. Vent tops shall be model MC Windcap thru 12" and model MC

Ventcap for larger sizes. The venting system shall comply with UL Standard 441.

- C. The Metal-Fab gas vent piping shall be installed in full compliance with the terms of its listing, with the manufacturer's installation instructions, and with nationally recognized building codes representing good practice for such installations.
- D. For venting systems with positive pressure requirements, use a UL listed positive pressure venting system.

PART 3 – EXECUTION

3.01 GENERAL

- A. All ductwork not specifically indicated on drawings or specified elsewhere to be medium- or high-pressure duct shall be fabricated, braced and erected in accordance with SMACNA "HVAC Duct Construction Standards" or the latest edition of ASHRAE "Handbook" at the SPWG Class Construction specified previously.
- B. Adhere to drawings as closely as possible. However, where required to meet structural or other interferences, vary the run and shape of ducts and make offsets during progress of work. Offsets shall be made at 45 degrees or less. Duct routes shall be established and field measurements shall be taken before ductwork is fabricated. Coordinate where pipes or other items are placed around the item. If duct collars for registers or grilles obstruct more than 10% of the cross sectional area, the duct shall be enlarged to accommodate obstruction.
- C. All changes of direction and elbows shall be fitted with turning vanes. Standard radius elbows having centerline radius of 1.5x duct width may be used if space permits. Refer to Fig. 2-2, SMACNA "Duct Construction Standards". Types RE1, RE 2, RE 3 and RE 5 are acceptable. Type RE 4, RE6 thru RE10 shall NOT be used. Mitered elbows greater than 40 degrees shall have turning vanes.
- D. Branch duct take-offs shall be flared, cone, or wye type.
- E. Ductwork shall be free of any objectionable self-generating noise or rattles.
- F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of system, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.02 DUCTWORK APPLICATION SCHEDULE

AIR SYSTEM

MATERIALS

Supply Air, Transfer Air	Steel
Return, Relief, Make-up Air	Steel
General Exhaust	Steel
And as specified	

3.03 ADJUSTING AND CLEANING

- A. If the ends of the ducts are not covered during construction the contractor shall clean duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes. Any cleaning of duct systems shall comply with recommendations of NAIMA and NADCA.

3.04 MANUAL BALANCING DAMPERS

- A. All low pressure branch ducts on either supply, return or exhaust shall be provided by some means of balancing in addition to dampers at registers and diffusers where indicated.
- B. Splitter dampers shall be made of at least the same thickness material as duct (minimum thickness 22-gauge). They shall be securely hinged at air leaving edge and made of 2 thicknesses so that entering edge presents a rounded surface to airflow. Provide splitter dampers only where indicated.
- C. Butterfly dampers up to 18" wide shall be made of minimum 22-gauge galvanized steel. Dampers up 48" wide shall be made of minimum 16-gauge galvanized steel. Butterfly dampers may be used in ducts with heights up to 10". Dampers that require blades over 10" high shall be multi-blade louver dampers. Refer to Fig. 2-12 and 2-13, SMACNA "Duct Construction Standards", First Edition, 1985. Fig. D shall NOT be used.
- D. Multi-blade louver dampers used for balancing shall be of the opposed blade type. Damper blades shall be constructed of 16-gage steel. Individual blade width shall not exceed 10" and blade length shall not exceed 48".
- E. All dampers shall be so constructed and installed that there shall be no vibration due to airflow over damper.

3.05 ACCESS DOORS

- A. Access doors shall be provided at all dampers, equipment in duct, and as shown on drawings.
- B. Access doors shall be minimum of 10" x 12" unless a larger size is required for maintenance of equipment or a smaller size must be used because of small duct size.

3.06 FLEXIBLE DUCT INSTALLATION

- A. Install without sharp bends, sags or dips.
- B. Secure to rigid duct and diffuser neck with minimum of two bands; one for the flexible duct and one for the insulation covering.

3.07 SEALING

- A. Seal all duct joints to the seal class in SMACNA Table 1-2 based on the construction class specified in 1.01 previously but the minimum seal class for all ductwork shall be seal class "C."

3.08 FLEXIBLE CONNECTIONS

- A. Furnish and install flexible connections on the inlet and outlet of each fan and unit to which duct connections are made.
- B. At least 1" slack shall be allowed in these connections to insure that no vibration is transmitted from fan to ductwork.
- C. The fabric shall either be folded in with the metal or attached with metal collar frames at each end to prevent air leakage.

3.09 FIRE DAMPERS, SMOKE DAMPERS, RADIATION DAMPERS

- A. Fire and/or smoke dampers shall be installed where indicated on drawings.
- B. Dampers shall be installed to conform to the UL listing for the specific dampers.

3.10 LOUVERS

- A. Recess louvers in face brick walls approximately 0.25".
- B. Mount units rigidly to walls and make weatherproof. Set brick vents and brick louvers in place during masonry erection.

3.11 FLUES

- A. Provide all pipe, fittings, stack cap, ventilated ceiling and/or roof thimble, drain section, flashing collars, and stack supports required for a complete installation. Install per manufacturer's recommendations and UL Listing.
- B. Horizontal and vertical flues shall be securely supported from building construction by galvanized strap iron.
- C. Submit shop drawings of venting system(s) for approval prior to installation.
- D. Flue type shall be as required for the application.

3.12 DUCT LINER

See drawings for additional ductwork requiring duct liner.

3.13 EXAMINATION

Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.14 INSTALLATION

Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions.

Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.15 ADJUSTING

After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.16 CLEANING

After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION 15800

SECTION 15900 – FIRE PROTECTION - GENERAL

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. The work outlined in this section shall be a part of the General Contract. The General Conditions, Supplementary General Conditions, and Information for Bidders apply to and are parts of this Section.
 - 2. The work shall include the necessary design, hydraulic calculations, shop drawings, labor, materials, appliances, and equipment to install the complete fire protection system in accordance with the requirements of the authorities having jurisdiction and these specifications with NO ADDITIONAL COST TO THE NAFI unless the scope of the building changes. The work shown on the drawings represents the minimum requirements only.
- B. RELATED SECTIONS AND STANDARDS
 - 1. Section 15000 – Mechanical – General
 - 2. Section 15100 – Basic Piping
 - 3. Section 15120 – Valves
 - 4. Section 15140 – Firestop Systems
 - 5. Section 15220 – Mechanical Supporting Systems
 - 6. Section 15230 – Mechanical Identification
 - 7. Section 15910 – Sprinkler Systems
 - 8. Section 15940 – Underground Fire Protection
 - 9. NFPA Pamphlets as may apply

1.02 GOVERNING AGENCIES, CODES, PERMITS AND INSPECTION

- A. The governing authority shall include the NAFI and applicable Local Codes..
- B. Work shall comply with the national fire codes as published by the National Fire Protection Association and the governing authorities.
- C. The Contractor shall obtain necessary permits required, paying fee therefor.
- D. The Contractor shall give required notice to the proper authorities relating to work under his charge and shall afford the NAFI and authorized inspectors every facility for inspection.
- E. Upon completion of the work, contractor shall obtain certificates of inspection and approval from the governing authority and deliver 3 copies to the NAFI.

1.03 QUALIFICATIONS OF CONTRACTOR

- A. Fire protection systems shall be installed by a Contractor with a specialty in automatic sprinkler and fire protection systems as required by authorities having jurisdiction. The Contractor must be licensed in the state where the project is located.

- B. Specialty contracting license shall have to be in force for no less than 5 years.

1.04 SUBMITTAL AND "RECORD SETS"

- A. Before commencing the fabrication and installation of the fire protection system, submit appropriate shop drawings, design information, and equipment cut sheets to the governing authorities. The submittal shall include the following as a minimum:
1. Scaled floor plan drawings on sheets of uniform size, no smaller than 1/8"=1'0" to include the following information.
 - a. Name of Fire Protection Engineer.
 - b. Location, including street address.
 - c. Point of compass.
 - d. Floor plan of each floor (if identical floors, typical plan permitted).
 - e. Description of occupancy of each building.
 - f. Building height in feet.
 - g. Full height building cross section if required to clarify installation of system.
 - h. Fire wall locations, large unprotected floor openings, unprotected window openings, fire doors.
 - i. Distances regarding code requirements of adjacent or nearby exposed buildings or structures.
 - j. Type, temperature ratings, and locations of all sprinkler heads.
 - k. Size and location of risers and standpipes with description and arrangement of valving and accessories, including the location of any and all hose valves, alarms, and signal devices.
 - l. Size and location of all mains and location of all branch lines.
 - (1) Area protected by each riser, each system, each floor.
 - m. If the project is in a seismic area and/or if seismic restraints and design is required by code, information attesting to this and restraint details shall be included on the drawings.
 - n. The location and size of the remote area coverage.
 - o. Pipe sizes for risers, feed mains, cross mains, standpipes, control valves.
 - p. Size and type of meter and valve pits.
 - q. Depth of top of buried pipe to grade.
 - r. The fire pump design, specifications and room layout (if required).
 - s. Standpipe design (if required) must be completely delineated on the shop drawings.
 - t. If extensions are made to existing systems, the same information shall be provided for the existing as well as that for the extensions, including point of connection to the existing main.
 - u. The shop drawings shall fully identify the intent of the type of systems, such as dry, wet, preaction, and/or deluge.
 2. Site plans: The plan shall be drawn to scale and shall include all essential details such as (See Civil Engineering Drawings):
 - a. Size and location of all water supplies.
 - b. Size and location of all piping, indicating, where possible, the class and type of new pipe to be installed, and the depth to which it is to be buried.

- c. Size, type, and location of valves. Indicate if located in pit or if operation is by post indicator or key wrench through a curb box. Indicate the size, type, and location of meters, regulators, and check valves.
 - d. Size and location of hydrants, showing size and number of outlets, and if outlets are to be equipped with independent gate valves. Indicate if hose houses and equipment are to be provided and by whom.
 - e. Sprinkler and standpipe risers and monitor nozzles to be supplied with the system.
 - f. Location of fire department connections; if part of private fire service main system, including detail of connections.
 - g. Water supply information:
 - (1) Information regarding whether the main is circulating or dead end.
 - (2) Pressures under flowing and static conditions. If available, information on orifice size and co-efficient of orifice used in the test, as well as pitot pressure.
 - (3) Applicable elevations of slab, floors, ceilings, street main connections, etc.
 - (4) Information regarding who conducted flow test, when, and where the test was conducted. If reliable or current (less than six months old) information is not available, a new flow test shall be done under the supervision of the Contractor.
- 3. Hydraulic calculations:
 - a. The Contractor shall prepare and submit hydraulic calculations; documents shall include the information required by NFPA-13.
- B. Submit the shop drawings and equipment cuts to the NAFI for review. This submittal shall bear the governing authorities approval stamp.
- C. At the completion of the work, the Contractor shall supply the NAFI with 3 sets of approved drawings and equipment cuts. At least 1 set shall bear the approval stamp of the governing authority. These sets shall be "RECORD SET" and shall reflect changes made during construction.

1.05 GUARANTEE AND SERVICE

- A. The entire fire protection installation, as specified and/or installed under this section of the specification, shall be guaranteed for 1 year against defective equipment, materials, and workmanship. The guarantee period is to begin on the date the building is accepted by the NAFI, as attested by final payment or substantial completion, whichever is earlier.
- B. During the 1-year guarantee period, the Contractor shall perform service as required.

END OF SECTION 15900

08/09/2011

equipment, materials, and workmanship. The guarantee period is to begin on the date the building is accepted by the NAFI, as attested by final payment or substantial completion, whichever is earlier.

- B. During the 1-year guarantee period, the Contractor shall perform service as required.

END OF SECTION 15900

SECTION 15910 – SPRINKLER SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. The work under this section shall include necessary engineering, labor, materials, appliances, and equipment to install a complete automatic sprinkler system in accordance with these specifications and all authorities having jurisdiction with no additional cost to NAFI unless scope or use of building changes.
- B. Related Sections:
 - 1. General for Applicable Requirements: Section 15900

1.02 REFERENCE STANDARDS

- A. NFPA Pamphlet 13 and 24 - Sprinkler Systems and Outside Fire Protection.
- B. Other NFPA Pamphlets as may apply including Pamphlet 20 - Fire Pumps.
- C. Publications by governing authority as may apply.
- D. Applicable UL Publications.

1.03 BID DOCUMENTS PLANS

- A. The design of the fire protection system is the responsibility of the fire protection subcontractor including the preparation of shop drawings and hydraulic calculations as necessary for approval by the authorities having jurisdiction and shall be installed accordingly. The work shown on the drawings represents the minimum requirements only. Coordinate all work with the with the NAFI's space allocation requirements.
- B. The Contractor shall design a fire protection sprinkler system based on the classification, class and types per NFPA requirements for occupancy.
- C. Contractor shall be responsible for coordination with all other work in the contract documents such as mechanical, structural, electrical and architecture systems and shall design to facilitate all features of the building while complying with NFPA.
- D. Any conflict between the governing authority and the plans and specifications shall be called to the attention of the NAFI at least 72 hours prior to bidding. Any conflicts not called out to NAFI and corrected by addendum shall be bid and installed according to the most stringent requirement.
- E. Provide and design a dry pipe sprinkler system for any area subject to freezing.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. All materials, equipment, valves and devices installed and/or furnished under this Section shall be listed and/or approved for use in the fire protection installation by the authorities, agencies, codes and standards of the governing agencies. Submit material and test certificates.
- B. Above ground systems components shall comply with NFPA Pamphlet No. 13.
- C. Sprinkler heads shall be as indicated on the drawings or as required.
- D. Provide extra sprinkler heads with cabinet. Provide no less than 1% of each type of head installed with a minimum of 6 and a maximum of 10 of each type.
- E. Supervisory switches shall be installed on all sectional valves. Provide terminals from dry contracts in box for connection to Fire Alarm System.
- F. Fire pump(s), if required, shall include control panel and emergency power transfer switch as applicable.

PART 3 – EXECUTION

3.01 INSTALLATION - GENERAL

- A. Comply with the requirements of the governing authority and NFPA No. 13 for installation of fire sprinkler piping materials. Install fire sprinkler piping products in accordance with recognized industry practices to ensure that fire sprinkler piping complies with requirements and serves its intended purpose.
- B. Coordinate with other work as necessary to interface components of fire sprinkler piping properly with other work, including all ceiling mounted work and/or the reflected ceiling plan(s). All sprinkler piping shall be concealed in building construction where possible.
- C. Where heads are installed in a patterned ceiling, locate in center of panels (or as approved by the NAFI).
- D. Discharge test drains so as not to interfere with building use when opened.
- E. Apply signs to control, drain, test and alarm valves to identify their purpose and function. Provide lettering size and style selected by NAFI from NFPA suggested styles.
- F. System shall be cleaned and tested in accordance with governing authority and NFPA 13.

3.02 PIPE HANGING

- A. Pipe Hangers and spacing shall conform to NFPA No. 13.
- B. Provide all auxiliary steel to carry the dead weight and dynamic load imposed by the piping.
- C. Design all auxiliary steel to carry the dead weight and dynamic load imposed by the piping.
- D. Any connection to the structural steel must be done in a manner as not to overload the structural steel.
- E. Where piping is supported off a concrete structure, inserts shall be used. In cases where pipes are supported from existing slab, use Phillips' "RED HEAD" or equal, sized for Safety Factor 4.
- F. Power driven studs and welding studs shall not be used.
- G. Where 5", 6", and 8" pipe is supported from bar joist each hanger shall be supported by at least 2 joist. Keep piping this size within 5' - 0" of column lines.

END OF SECTION 15910

SECTION 15940 – UNDERGROUND FIRE PROTECTION SYSTEM

PART 1 – GENERAL

- 1.01 Scope: Refer to Division 1, General Requirements. All of the provisions listed or specified therein apply to the work of this section.
- 1.02 Work Included: Furnish all labor, materials, equipment, and services required for, and/or reasonably incidental to the completion of the following work. Include all such work shown on the drawings and/or listed below unless specifically shown on the drawings as “NIC” (Not In Contract) or listed in this section under “Work Not Included,” or “Related Work Under Other Sections.”
- A. Valves and post indicator valve(s) (PIV), and fire department connection(s) as required and location as directed on fire protection drawings.
 - B. Trenching and backfill for all underground piping.
 - C. Piping and valves, as required. Compliance with all design requirements and approval of the NAFI. Preparation of all required shop drawings and details for the approval and installation of the system.
 - D. General Conditions, under Division 15, Mechanical, Sections shall be considered part of this section.
 - E. Arranging for all required permits and inspections for the local code enforcement agency and fire officials. Cost of all testing, permits, and special inspection required by them shall be paid for by this contractor.
- 1.03 Code Requirements
- A. All work shall comply with the requirements of applicable Federal, State, and local building and safety codes, ordinances, and regulations.
 - B. Special attention shall be given to rulings of the local utility water department and fire department.
 - C. Nothing in this specifications or on the plans shall be construed as permitting any departure from any applicable Federal, State, and/or local building and safety codes, ordinances and regulations, or from any requirements of the local fire department, building department, and/or NAFI.
- 1.04 Subcontractor Qualifications
- A. The Contractor must be licensed by the State Contractor’s License Board and hold a valid fire sprinkler contractor’s license to install underground fire protection lines. No portion of the installation of the underground fire water system (except digging and backfilling) shall be subcontracted.

- B. This contractor shall submit shop drawings and inspection certificates to the NAFI, in a timely manner. Refer to section 15900 paragraph 1.03A for qualifications and requirements.
- 1.05 Shop Drawings and Submittals: Shop drawings and material submittals for the work under this section shall be submitted to the NAFI for approval prior to installation. See Section 01300 – Submittals of this Project Manual for submittal schedule, routing, submittal type, etc.
- A. Submit five (5) blue-line or black-line sets of shop drawings and one (1) set of reproducible tracings prior to installation.
 - B. Submit five (5) sets of material lists and manufacturers' cuts. This shall include all material to be used on the job. Substitution of materials must be requested in accordance with Section 01600 – Products of this project Manual and be approved by the NAFI prior to installation.
 - C. Shop drawings shall show all details and information required by NFPA 13 and/or NFPA 24. In addition, all thrust blocks (design and location) shall be shown.
 - D. Shop drawings submitted for review shall bear the stamps of approval/acceptance of the local fire official, and the NAFI's insurance underwriter. Shop drawings shall be accompanied by letters of comment from the local fire official, the NAFI's insurance underwriter, and the local utility water department. Failure to comply with the above requirements will result in rejection and re-submittal will be necessary.
 - E. Keep a current set of as-built drawings on the job at all times. These drawings should be updated as changes are made and shall be kept in the General Contractor's on-site office.
 - F. Keep a current set of specifications and materials list, with catalog cuts, in the General Contractor's on-site office at all times.
 - G. Upon completion of the project, submit two (2) copies of a loose-leaf manual containing manufacturers' cuts for all equipment to the NAFI.
- 1.06 Design of Systems: The following are minimum criteria set by the NAFI. If any agency having jurisdiction has other requirements they shall be incorporated in the design of the system and shall be complied with as if written into this specification.
- A. The riser locations are shown on the drawings. Any requests for changes must be submitted to the NAFI 48 hours prior to Bid Time in order to be considered.
 - B. All work shall be designed in accordance with the requirements of the local fire official, NAFI, the latest editions of NFPA 13 and 24, and the appropriate edition of the Standard Building Code and Standard Fire Code (as modified by local ordinances, rulings, etc.)

- C. Fire protection system shall be designed to avoid all other utility lines, conduit, and structural components shown on the drawings. Fire protection system lines must give way to all gravity lines.

1.07 Coordination

- A. The contractor shall be responsible for details not controlled by job conditions and shall show required field measurements beyond his control on the shop drawings.
- B. Consult with other trades in advance and make provisions for their work to avoid cutting and patching.
- C. Notify responsible trades of schedules to allow adequate time for installation and coordination of their work.

1.08 Guarantee

- A. Provide Manufacturer's one (1) year guarantee for materials and workmanship.

PART 2 – PRODUCTS

2.01 Materials

- A. All materials shall be new and currently listed in the Underwriters Laboratories, Inc., Fire Protection Equipment List, and shall be acceptable to the local fire marshal. Material pending approval shall not be acceptable.
- B. All materials shall conform to the requirements of the water district and county health agency.
- C. Fire protective piping materials shall be as follows:
 - 1. Underground pipes, fittings, and joints shall be Class 350 (minimum) ductile iron pipe conforming to ANSI A21-51; or AWWA C-900, DR-18, Class 150 PVC, Class 250 cast iron or ductile iron fittings conforming to ANSI A21.10; pipe and fittings shall have standard thickness bituminous sealed, cement mortar lining, bituminous outside coating, and mechanical or push-on joints with plain rubber gaskets. All piping shall be UL or FM approved for fire water systems.
 - 2. Flanges for cast iron and ductile iron shall be properly sized for each pipe and shall have counter-bored, long hubs completely covering pipe threads; standard steel bolts and nuts; plain rubber gaskets.
- D. Cut-off Valves: Provide post indicating valves (PIV) as indicated on the drawings. Provide supervisory switches for annunciation at the fire alarm panel. Locate minimum 40 feet from building:

PART 3 – EXECUTION

3.01 Installation:

- A. Prior to bid, visit the job site and become familiar with the local conditions, including verification of the location of the existing utilities.
- B. All piping shall be installed in a manner acceptable to the local fire marshal, and the local authority.
- C. Install piping with ample flexibility to permit free expansion and contraction of pipework without putting excessive stress on piping, supports, or equipment, or causing damage or breakage.
- D. On underground pipe, adequately brace joints which are subject to separating under pressure with concrete placed between firm trench walls and unbalanced sides of fittings, or set-screw type retainer glands, or other suitable clamps or bridle rods (as applicable).
- E. All piping shall be installed in accordance with Section 3 of the AWWA Standard C600.
- F. All piping shall be pressure tested and flushed according to the procedures set forth in NFPA 13 and NFPA 24, the requirements of the local utility water department, and the requirements of the local fire official.
- G. The Contractor shall be responsible for determining the bearing capacity of the soil (soil testing to be conducted after the site has been cleared, report will follow). All thrust blocks shall be designed to conform to the requirements of NFPA 24, taking into consideration the bearing capacity of the soil. Size and design of thrust blocks shall be shown on the shop drawings.
- H. All equipment installed under this section shall be properly thrust blocked. This Contractor shall be responsible for the proper design and installation of the equipment and for satisfying the local fire official and the NAFI that this requirement has been met.
- I. All equipment installed under this section shall be protected from external damage. This contractor shall be responsible for the proper design and installation of the equipment and for satisfying the local fire official and the NAFI that this requirement has been met. Shop drawings shall show details of protection equipment.
- J. The Contractor shall furnish and install all sleeves required for his work where it passes through concrete. If sleeves are not installed, all penetrations shall be core drilled. All penetrations shall be approved by the NAFI before drilling.
- K. The Contractor shall be responsible for any damage to other work caused by this installation or by leaks in the fire protection lines.

- L. The Contractor shall be responsible for coordinating his work with the electrical, mechanical, and plumbing contractors and with other trades.
 - M. All work shall be done in a neat and workmanlike manner.
- 3.02 Cleaning of Exterior Fire Main System: After underground piping system for fire protection has been completed, and before it is permanently filled with water, flush the entire system thoroughly. During flushing operations, close the valves to all inside sprinkler equipment to prevent washing debris into the inside system. Flush all branches from outside to inside system before connection to sprinkler or risers. Cleaning shall be done in accordance with NFPA 24. Make temporary connections only necessary to implement this procedure.
- 3.03 Record Drawings:
- A. Keep a current set of as-built drawings on the site at all times. These drawings should be updated as changes are made and shall be kept in the construction office (see also Special Conditions).
 - B. Keep a current set of specifications and materials lists with catalog cuts in the construction office at all times.
 - C. Upon completion of the project, submit two (2) copies of a loose-leaf manual containing the manufacturers' cuts for all equipment to the NAFI.
- 3.04 Clean-Up: Perform the work of this section keeping the affected areas of the site neat, clean, and orderly at all times. Upon completion of the work immediately remove all surplus materials, rubbish, and equipment associated with or used in the performance of this work. Failure to perform such clean-up operations within twenty-four (24) hours of notice by the NAFI or General Contractor shall be considered adequate grounds for having the work done by others at the underground fire protection system contractor's expense.

END OF SECTION 15940

HYDRAULIC CALCULATIONS
for

Project name: Ponta Creek Clubhouse (OH2)
Location:
Drawing no:
Date:

Design

Remote area number:
Remote area location:
Occupancy classification:
Density: .2 - Gpm/SqFt
Area of application: - SqFt
Coverage per sprinkler: 120 - SqFt
Type of sprinklers calculated:
No. of sprinklers calculated: 12
In-rack demand: - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 598.34 - GPM @ 57.5063 - Psi
Type of system: Wet
Volume of dry or preaction system: - Gal

Water supply information

Date:
Location:
Source:

Name of contractor:
Address:
Phone number:
Name of designer:
Authority having jurisdiction:
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve (C)

Ponta Creek Clubhouse (OH2)

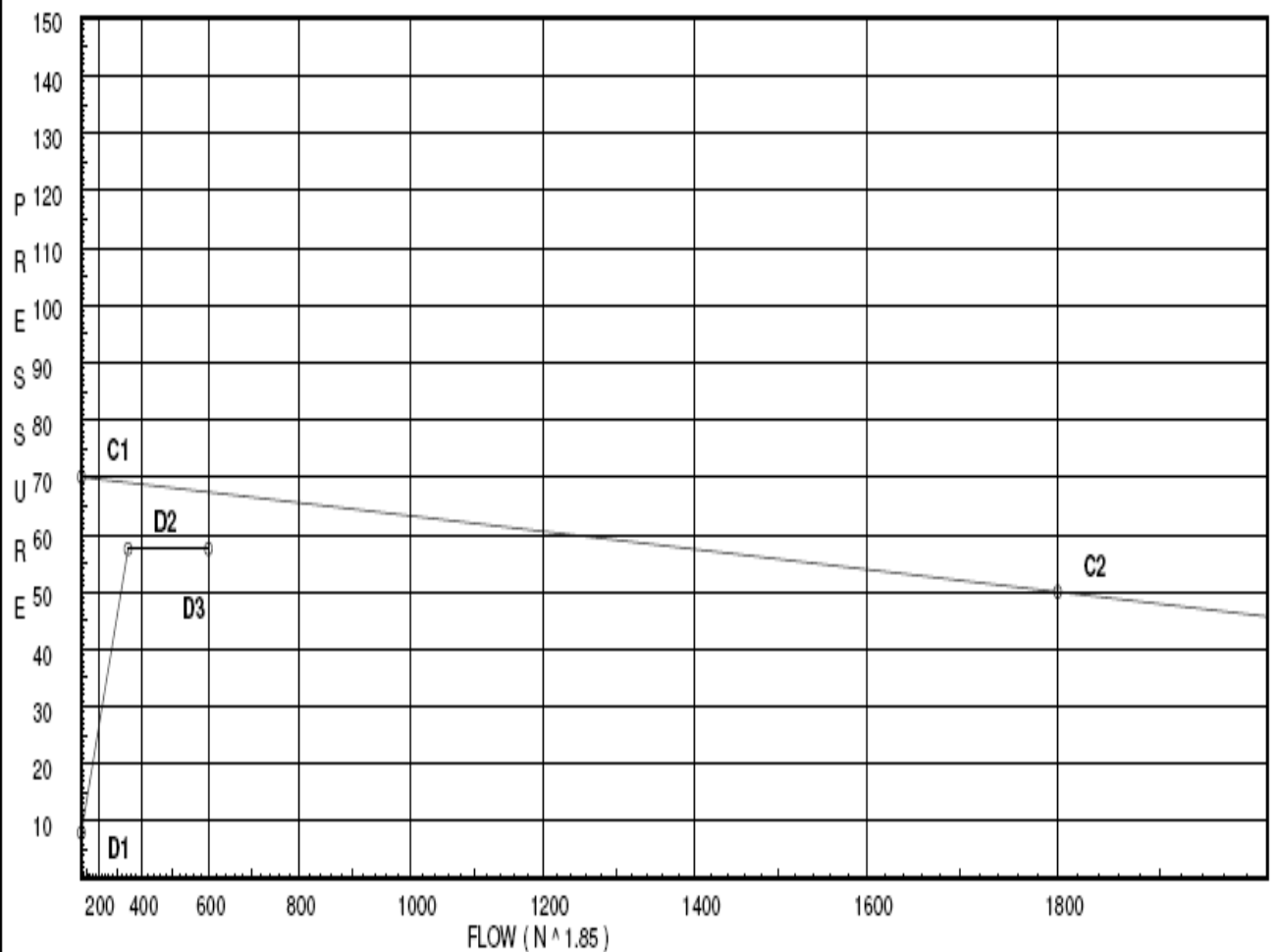
Page 2
Date

City Water Supply:

C1 - Static Pressure : 70
 C2 - Residual Pressure: 50
 C2 - Residual Flow : 1800

Demand:

D1 - Elevation : 8.012
 D2 - System Flow : 348.34
 D2 - System Pressure : 57.506
 Hose (Adj City) : _____
 Hose (Demand) : 250
 D3 - System Demand : 598.34
 Safety Margin : 9.887



Fittings Used Summary

Ponta Creek Clubhouse (OH2)

Page 3
Date

Fitting Legend																					
Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
A	Alarm Rel E1 & E3							7.7	21.5		17		27	29							
E	NFPA 13 90° Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
T	NFPA 13 90° Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Pressure / Flow Summary - STANDARD

Ponta Creek Clubhouse (OH2)								Page 4
Date								
Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
1	20.0	8	10.97	na	26.5	0.2	95	7.0
3	20.0	8	11.47	na	27.09	0.2	115	7.0
4	18.5	8	7.97	na	22.59	0.2	50	7.0
5	18.5	8	9.0	na	24.0	0.2	120	7.0
7	18.5	8	11.68	na	27.34	0.2	120	7.0
8	16.333	8	13.36	na	29.24	0.2	120	7.0
9	16.333	8	14.16	na	30.1	0.2	120	7.0
11	14.167	8	15.92	na	31.92	0.2	120	7.0
13	14.167	8	16.86	na	32.85	0.2	120	7.0
14	12.083	8	14.07	na	30.0	0.2	80	7.0
15	12.083	8	15.23	na	31.22	0.2	120	7.0
17	12.083	8	19.69	na	35.49	0.2	120	7.0
2	20.0		12.07	na				
6	18.5		12.11	na				
10	16.333		14.67	na				
12	14.167		17.46	na				
16	12.083		20.38	na				
2A	18.0		13.93	na				
6A	16.5		14.79	na				
10A	14.333		16.74	na				
12A	12.167		19.75	na				
16A	10.083		24.23	na				
TOR	10.083		38.56	na				
BOR	1.0		43.44	na	100.0			
L1	-4.0		46.56	na				
UG1	-4.0		51.25	na	150.0			
TEST	0.0		57.51	na				

The maximum velocity is 30.58 and it occurs in the pipe between nodes 16A and TOR

Final Calculations - Hazen-Williams

Ponta Creek Clubhouse (OH2)									
Page 5 Date									
Hyd. Ref. Point	Qa Qt	Dia. "C" P/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes *****
***LINE #1									
1	26.50	1.38	1E	3.0	10.000	10.973			K Factor = 8.00
to		120.0	1T	6.0	9.000	0.0			
2	26.5	0.0576		0.0	19.000	1.095			Vel = 5.68
	0.0								
	26.50					12.068			K Factor = 7.63
3	27.09	1.38	1E	3.0	1.000	11.467			K Factor = 8.00
to		120.0	1T	6.0	9.000	0.0			
2	27.09	0.0601		0.0	10.000	0.601			Vel = 5.81
	0.0								
	27.09					12.068			K Factor = 7.80
***LINE #2									
4	22.59	1.38	3E	9.0	15.000	7.971			K Factor = 8.00
to		120.0		0.0	9.000	0.0			
5	22.59	0.0429		0.0	24.000	1.029			Vel = 4.85
5	24.00	1.38	1T	6.0	13.000	9.000			K Factor = 8.00
to		120.0		0.0	6.000	0.0			
6	46.59	0.1636		0.0	19.000	3.108			Vel = 9.99
	0.0								
	46.59					12.108			K Factor = 13.39
7	27.34	1.38	1T	6.0	1.000	11.681			K Factor = 8.00
to		120.0		0.0	6.000	0.0			
6	27.34	0.0610		0.0	7.000	0.427			Vel = 5.86
	0.0								
	27.34					12.108			K Factor = 7.86
***LINE #3									
8	29.24	1.38	1T	6.0	13.000	13.357			K Factor = 8.00
to		120.0		0.0	6.000	0.0			
10	29.24	0.0691		0.0	19.000	1.313			Vel = 6.27
	0.0								
	29.24					14.670			K Factor = 7.63
9	30.10	1.38	1T	6.0	1.000	14.160			K Factor = 8.00
to		120.0		0.0	6.000	0.0			
10	30.1	0.0729		0.0	7.000	0.510			Vel = 6.46
	0.0								
	30.10					14.670			K Factor = 7.86
***LINE #4									
11	31.92	1.38	1T	6.0	13.000	15.916			K Factor = 8.00
to		120.0		0.0	6.000	0.0			
12	31.92	0.0812		0.0	19.000	1.543			Vel = 6.85
	0.0								
	31.92					17.459			K Factor = 7.64
13	32.85	1.38	1T	6.0	1.000	16.859			K Factor = 8.00
to		120.0		0.0	6.000	0.0			
12	32.85	0.0857		0.0	7.000	0.600			Vel = 7.05
	0.0								
	32.85					17.459			K Factor = 7.86

Final Calculations - Hazen-Williams

Ponta Creek Clubhouse (OH2)									
Page 6									
Date									
Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes *****
***LINE #5									
14	30.00	1.38	1E	3.0	13.000	14.066			K Factor = 8.00
to		120.0		0.0	3.000	0.0			
15	30.0	0.0725		0.0	16.000	1.160			Vel= 6.44
15	31.22	1.38	1T	6.0	13.000	15.226			K Factor = 8.00
to		120.0		0.0	6.000	0.0			
16	61.22	0.2712		0.0	19.000	5.152			Vel= 13.13
	0.0								
	61.22					20.378			K Factor = 13.56
17	35.49	1.38	1T	6.0	1.000	19.685			K Factor = 8.00
to		120.0		0.0	6.000	0.0			
16	35.49	0.0990		0.0	7.000	0.693			Vel= 7.61
	0.0								
	35.49					20.378			K Factor = 7.86
***RISER NIPPLES									
2	53.59	1.61	1T	8.0	2.000	12.068			
to		120.0		0.0	8.000	0.866			
2A	53.59	0.1000		0.0	10.000	1.000			Vel= 8.45
	0.0								
	53.59					13.934			K Factor = 14.36
6	73.93	1.61	1T	8.0	2.000	12.108			
to		120.0		0.0	8.000	0.866			
6A	73.93	0.1814		0.0	10.000	1.814			Vel= 11.65
	0.0								
	73.93					14.788			K Factor = 19.22
10	59.34	1.61	1T	8.0	2.000	14.670			
to		120.0		0.0	8.000	0.866			
10A	59.34	0.1209		0.0	10.000	1.209			Vel= 9.35
	0.0								
	59.34					16.745			K Factor = 14.50
12	64.76	1.61	1T	8.0	2.000	17.459			
to		120.0		0.0	8.000	0.866			
12A	64.76	0.1421		0.0	10.000	1.421			Vel= 10.21
	0.0								
	64.76					19.746			K Factor = 14.57
16	96.71	1.61	1T	8.0	2.000	20.378			
to		120.0		0.0	8.000	0.866			
16A	96.71	0.2982		0.0	10.000	2.982			Vel= 15.24
	0.0								
	96.71					24.226			K Factor = 19.65
***MAIN BACK TO RISER									
2A	53.59	2.157		0.0	8.500	13.934			
to		120.0		0.0	0.0	0.650			
6A	53.59	0.0240		0.0	8.500	0.204			Vel= 4.71
6A	73.93	2.157		0.0	8.500	14.788			
to		120.0		0.0	0.0	0.939			
10A	127.52	0.1198		0.0	8.500	1.018			Vel= 11.20

Final Calculations - Hazen-Williams

Ponta Creek Clubhouse (OH2)									
Page 7 Date									
Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes *****
10A	59.34	2.157		0.0	8.500	16.745			
to		120.0		0.0	0.0	0.938			
12A	186.86	0.2427		0.0	8.500	2.063		Vel =	16.41
12A	64.76	2.157		0.0	8.500	19.746			
to		120.0		0.0	0.0	0.903			
16A	251.62	0.4208		0.0	8.500	3.577		Vel =	22.09
16A	96.72	2.157	1E	6.153	12.500	24.226			
to		120.0		0.0	6.153	0.0			
TOR	348.34	0.7683		0.0	18.653	14.331		Vel =	30.58
TOR	0.0	4.26	1G	2.633	9.083	38.557			
to		120.0	1A	22.384	25.017	3.934			
BOR	348.34	0.0279		0.0	34.100	0.952		Vel =	7.84
BOR	100.00	4.175	1E	15.875	10.000	43.443		Qa =	100
to		140.0		0.0	15.875	2.166			
L1	448.34	0.0369		0.0	25.875	0.956		Vel =	10.51
L1	0.0	4.11	1T	33.419	100.000	46.565			
to		150.0		0.0	33.418	0.0			
UG1	448.34	0.0351		0.0	133.418	4.684		Vel =	10.84
UG1	150.00	4.11	1T	33.419	100.000	51.249		Qa =	150
to		150.0		0.0	33.418	-1.732			
TEST	598.34	0.0599		0.0	133.418	7.989		Vel =	14.47
	0.0								
	598.34					57.506		K Factor =	78.90

END OF SECTION 15950

DIVISION 16 -ELECTRICAL

16060	GROUNDING AND BONDING
16073	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
16075	ELECTRICAL IDENTIFICATION
16120	CONDUCTORS
16130	RACEWAYS AND BOXES
16140	WIRING DEVICES
16410	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
16442	PANELBOARDS
16500	LIGHTING
16720	DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM

SECTION 16060 - GROUNDING AND BONDING**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS**2.1 CONDUCTORS**

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 4. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Conductor Terminations and Connections:
 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Underground Connections: Welded connectors.
 3. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all circuits.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at service disconnect enclosure grounding terminal.
 - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.

B. Excessive Ground Resistance: If resistance to ground exceeds 10 ohms, notify NAFI promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16073 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**PART 1 - GENERAL****1.1 SUMMARY****A. Section includes:**

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.2 SUBMITTALS**A. Product Data:** For steel slotted support systems.**B. Shop Drawings:** Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

PART 2 - PRODUCTS**2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS****A. Steel Slotted Support Systems:** Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Allied Tube & Conduit.
- b. Cooper B-Line, Inc.; a division of Cooper Industries.
- c. ERICO International Corporation.
- d. GS Metals Corp.
- e. Thomas & Betts Corporation.
- f. Unistrut; Tyco International, Ltd.
- g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 5. Toggle Bolts: All-steel springhead type.
 - 6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

- 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To New Concrete: Bolt to concrete inserts.
 - 2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 3. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 4. To Light Steel: Sheet metal screws.
 - 5. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 16073

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Underground-line warning tape.
2. Equipment identification labels.
3. Miscellaneous identification products.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

PART 2 - PRODUCTS

2.1 UNDERGROUND WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility conduits.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Tag: Type ID:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft..

5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.2 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Underground Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above conduit at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.2 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in switchgear, pull and junction boxes, and handholes, use color-coding conductor tape to identify the phase.
 1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
- B. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- C. Locations of Underground Conduits: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

- D. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

- a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
- b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
- c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
- d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 16075

SECTION 16120 - CONDUCTORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Building wires rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
 - 5. Tyco Electronics Corp.

- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- H. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- I. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS

- A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage conductors or raceway.

- C. Identify and color-code conductors according to Division 16 Section "Electrical Identification."
- D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- E. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- F. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- B. Cut sleeves to length for mounting flush with both wall surfaces.
- C. Extend sleeves installed in floors 2 inches above finished floor level.
- D. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- E. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7 Section "Joint Sealants."
- F. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations.
- G. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- H. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- I. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors to ensure conductors are free from short circuits.
- C. Remove and replace malfunctioning units and retest.

END OF SECTION 16120

SECTION 16130 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. EMT: ANSI C80.3.
- C. FMC: Zinc-coated steel.
- D. LFMC: Flexible steel conduit with PVC jacket.
- E. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Fittings for EMT: Steel or die-cast, set-screw or compression type.

2.2 NONMETALLIC CONDUIT

- A. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- B. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.
 - 2. Concealed Conduit, Aboveground: EMT.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed and Subject to Physical Damage: Rigid steel conduit.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 5. Damp or Wet Locations: Rigid steel conduit.
 - 6. Raceways for Optical Fiber or Communications Cable: EMT.
 - 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 16 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- G. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
- H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- I. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations
- J. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Refer to Division 16 Section "Electrical Identification" for underground line warning tape requirements.
 - 2. Install manufactured rigid steel conduit elbows for stub-ups at equipment and at building entrances through the floor.
 - a. Couple steel conduits to RNC with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3.4 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Snap switches and wall-box dimmers.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 5351 (single), 5352 (duplex).

- b. Hubbell; HBL5351 (single), CR5352 (duplex).
- c. Leviton; 5891 (single), 5352 (duplex).
- d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; GF20.
 - b. Pass & Seymour; 2084.

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
 - 2. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Unbreakable nylon with finish as selected by the Architect.
 - 3. Material for Unfinished Spaces: Unbreakable nylon with finish as selected by the Architect.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

2.6 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
- D. Device Installation:
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 8. Tighten unused terminal screws on the device.
 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 FIELD QUALITY CONTROL

- A. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
 2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 3. Using the test plug, verify that the device and its outlet box are securely mounted.

END OF SECTION 16140

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Enclosures.

1.2 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Suitable for number, size, and conductor material.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Lugs: Suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Features and Accessories:
 1. Standard frame sizes, trip ratings, and number of poles.
 2. Lugs: Suitable for number, size, trip ratings, and conductor material.

3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Division 16 Section "Hangers and Supports for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Division 16 Section "Electrical Identification."
 1. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
- C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

END OF SECTION 16410

SECTION 16442 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.

1.4 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 3. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- B. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- C. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- D. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- E. Panelboard Short-Circuit Current Rating: Fully rated as indicated on drawings.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: See drawings.

- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Square D; a brand of Schneider Electric.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 3. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - e. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - f. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 16 Section "Hangers and Supports for Electrical Systems."
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- H. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 16 Section "Electrical Identification."
- B. Create a directory to indicate installed circuit loads; incorporate NAFI's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 16 Section "Electrical Identification."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 16 Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.

END OF SECTION 16442

SECTION 16500 - LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Exit signs.
 - 3. Lighting fixture supports.

1.2 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

- C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

2.3 BALLASTS

- A. Electronic Ballasts for Linear Fluorescent Lamps: Comply with ANSI C82.11; instant-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.
 - 1. Sound Rating: A.
 - 2. Total Harmonic Distortion Rating: Less than 20 percent.
 - 3. Transient Voltage Protection: IEEE C62.41, Category A or better.
 - 4. Operating Frequency: 20 kHz or higher.
 - 5. Lamp Current Crest Factor: 1.7 or less.
 - 6. BF: 0.85 or higher.
 - 7. Power Factor: 0.95 or higher.
- B. Ballasts for Compact Fluorescent Lamps: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
 - 1. Lamp end-of-life detection and shutdown circuit.
 - 2. Automatic lamp starting after lamp replacement.
 - 3. Sound Rating: A.
 - 4. Total Harmonic Distortion Rating: Less than 20 percent.
 - 5. Transient Voltage Protection: IEEE C62.41, Category A or better.
 - 6. Operating Frequency: 20 kHz or higher.
 - 7. Lamp Current Crest Factor: 1.7 or less.
 - 8. BF: 0.95 or higher, unless otherwise indicated.
 - 9. Power Factor: 0.95 or higher.
 - 10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
 - 11. Ballast Case Temperature: 75 deg C, maximum.

- C. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features, unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F for single-lamp ballasts.
3. Normal Ambient Operating Temperature: 104 deg F.
4. Open-circuit operation that will not reduce average life.
5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

2.4 EXIT SIGNS

- A. Internally Lighted Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2.5 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.6 LAMPS

- A. Low-Mercury Fluorescent Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- B. T8 Rapid-Start low-mercury Fluorescent Lamps: Rated 32 W maximum, nominal length 48 inches, 2800 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.
- C. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 82 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.

- D. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 65, and color temperature 4000 K.

2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture supports.
- C. Steel cable support assemblies shall be installed per the manufacturer's instructions. Refer to drawings for additional requirements.
- D. Adjust aimable lighting fixtures to provide required light intensities.
- E. Connect wiring according to Division 16 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

END OF SECTION 16500

SECTION 16720 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-alarm control unit.
 - 2. Manual fire-alarm boxes.
 - 3. System smoke detectors.
 - 4. Heat detectors.
 - 5. Notification appliances.
 - 6. Remote annunciator.
 - 7. Addressable interface device.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

- A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.5 SUBMITTALS

- A. General Submittal Requirements:
 - 1. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician, Level II minimum.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Field quality-control reports.

E. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," deliver copies to authorities having jurisdiction and include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals.
4. Manufacturer's required maintenance related to system warranty requirements.
5. Abbreviated operating instructions for mounting at fire-alarm control unit.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: All fire alarm wiring and components shall be installed by the equipment supplier. All installers shall be certified by NICET as fire-alarm Level II technicians. Refer to Submittals section.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Harlow.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Smoke detectors.
 - 4. Duct smoke detectors.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Continuously operate alarm notification appliances.
 - 2. Identify alarm at fire-alarm control unit and remote annunciators.
 - 3. Transmit an alarm signal to the remote alarm receiving station.
 - 4. Record events in the system memory.
- C. System trouble signal initiation shall be by one or more of the following devices and actions:
 - 1. Open circuits, shorts, and grounds in designated circuits.
 - 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 - 3. Loss of primary power at fire-alarm control unit.
 - 4. Ground or a single break in fire-alarm control unit internal circuits.
 - 5. Abnormal ac voltage at fire-alarm control unit.
 - 6. Break in standby battery circuitry.
 - 7. Failure of battery charging.
 - 8. Abnormal position of any switch at fire-alarm control unit or annunciator.
- D. System Trouble Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.

2.3 FIRE-ALARM CONTROL UNIT

- A. General Requirements for Fire-Alarm Control Unit:
 - 1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

- a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
 - b. Include a real-time clock for time annotation of events on the event recorder and printer.
- 2. Addressable initiation devices that communicate device identity and status.
 - a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
 - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
- B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
 - 1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.
 - 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
- C. Circuits:
 - 1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.
 - 2. Signaling Line Circuits: Panel shall be equipped with one (expandable to two) signaling line circuits. Each circuit shall have a capacity of 250 addressable devices.
 - 3. Notification Appliance Circuits: Panel shall be equipped with four 2A notification appliance circuits with solid-state current protection.
 - 4. Serial Interfaces: Two RS-232 ports for printers.
- D. Notification Appliance Circuit: Operation shall sound in a temporal pattern.
- E. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory.
- F. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
1. Batteries: Sealed lead calcium.

2.4 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 2. Station Reset: Key- or wrench-operated switch.

2.5 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
1. Comply with UL 268; operating at 24-V dc, nominal.
 2. Detectors shall be two-wire type.
 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
 4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
 5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
 6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
 7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
 - a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
 - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
 - c. Provide multiple levels of detection sensitivity for each sensor.
- B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
- B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
- C. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
 1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field.
 2. Mounting: Wall mounted unless otherwise indicated.
 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 4. Flashing shall be in a temporal pattern, synchronized with other units.
 5. Strobe Leads: Factory connected to screw terminals.
 6. Mounting Faceplate: Factory finished, white.

2.8 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
 1. Mounting: Flush cabinet, NEMA 250, Type 1.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.9 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown.

2.10 RADIO ALARM TRANSMITTER

- A. Furnish all hardware as required to interface with existing Harlow radio transmitter.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.
 - 1. Comply with requirements for seismic-restraint devices specified in Division 16 Section "Hangers and Supports for Electrical Systems."
- C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- D. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
- E. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.3 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from telecommunications main grounding bar (TMGB) to fire-alarm control unit.

3.4 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

- b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 - 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 - 3. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- 3.5 DEMONSTRATION
- A. Engage a factory-authorized service representative to train NAFI's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 16720